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### Scientific approaches of community energy

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# Scientific approaches of community energy

a literature review

Tineke van der Schoor  
& Bert Scholtens

Centre for Energy Economics Research (CEER)

Policy Papers | No. 6 | June 2019

# **Scientific approaches of community energy a literature review**

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Schoor, C. van der; Scholtens, L.J.R.

Scientific approaches of community energy, a literature review, Centre for Energy Economics Research, CEER Policy Papers 6 – University of Groningen, The Netherlands – June 2019

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Appendix A contains a list of the corpus of 263 articles, including authors, title, journal, publication year, country of study, used keywords and theoretical approaches and is available online:

[https://www.rug.nl/ceer/blog/ceer\\_policypaper\\_6\\_APPA\\_web.pdf](https://www.rug.nl/ceer/blog/ceer_policypaper_6_APPA_web.pdf)

Appendix B contains a list of keywords provided by the authors of the articles in the corpus and is available online:

[https://www.rug.nl/ceer/blog/ceer\\_policypaper\\_6\\_APPB\\_web.pdf](https://www.rug.nl/ceer/blog/ceer_policypaper_6_APPB_web.pdf)

Cover photo: William Perugini

Abbreviations: In the text, corpus articles are indicated with the prefix c, within brackets (c.), articles that are used in the main text and also appear in our corpus are indicated with both the usual reference and a corpus number: (..)/c. For example: Seyfang et al. (2014)/c208

@Van der Schoor & Scholtens

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## Introduction

Renewable energy is on the rise in most of the European Union (EU) member states. In 2015, the share of energy from renewable sources in gross final consumption of energy reached 16.7% in the EU; nearly double 2004 (8.5%), the first year for which the data are available.<sup>1</sup> The International Energy Agency in its World Energy Outlook expects it to become the largest source of electricity generation in the EU by 2030<sup>2</sup> (IEA, 2016). In several European countries, an increasing part of the production of renewable energy is generated by citizen-owned production units. These units are installed and managed individually or by local communities, and the number of local energy initiatives, who aim to increase local energy production, is rising rapidly. This has resulted in a new research area we label as community energy. In our study, we use community energy to encompass several terms that have been used so far in the literature, such as citizen's power, grassroots energy, and local governance of energy production. In this respect, we highlight the role of the individual, acting as consumer, prosumer or citizen. Throughout this paper, community energy is defined as local production of renewable energy, governed by citizens, with a view to contribute to the transition to a sustainable energy system. Our aim is to identify the key issues and concepts covered in the community energy literature so far and to reflect on how it is studied.

The community perspective is highly relevant for energy policy, especially regarding the transformation to an energy system that relies on non-fossil and renewable energy sources. Traditionally energy policy is a top-down approach, which relies on taxes, subsidies and

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<sup>1</sup> Eurostat Newsrelease 43/2017 – March 14, 2017.

<sup>2</sup> Source: International Energy Agency (IEA). 2016. World Energy Outlook. Paris: IEA.

regulations. These policies for sure will affect the start-up and success of local initiatives. But community energy is a bottom-up and grassroots phenomenon that is difficult to integrate with conventional policy. The main reason is because it is local and highly context-specific. At the local level, municipalities may try to mitigate or stimulate the community initiatives. Given the importance of the local context, it is likely that community energy has ramifications that go beyond the production and distribution of energy only. Community energy is in the frontline of acceptance of alternative ways of energy generation and the energy system transformation. It also highlights the importance of community sense and the role of small and medium-sized enterprises in the transformation. Community energy is a focal point which brings together a wide array of perspectives regarding how to organize a society, specifically at the local level. Therefore, it does not come as a surprise that within and between countries we witness very different experiences and approaches with community energy and policies to stimulate, integrate and mitigate it. Of course, it should be mentioned that community energy is unlikely to be the sole or main driver of the transformation of the energy system. As there is a very skewed distribution of both the production and consumption of energy, it is unlikely to play a dominant role at the national level. However, at the local or regional level, it may result in a very substantial contribution to the supply of renewable energy. Therefore, it is of interest to both national and local policy makers.

In academia, the community lens has been used for analytical purposes before. For example, Howard Jones addresses the (potential) role of community action in a democracy in the *Annals of the American Academy of Political and Social Sciences* in 1938. It shows that the contribution of communities to the energy transition has attracted

attention in the literature (Araújo, 2014; Hauber & Ruppert-Winkel, 2012; Hielscher, Seyfang, & Smith, 2013). Local transitions to energy-neutral or low-carbon communities especially have been studied by analysing national or regional cases and policy (Alexander, Hope, & Degg, 2007; Chmutina & Goodier, 2013; Emelianoff, 2013; Forrest & Wiek, 2014; Hauber & Ruppert-Winkel, 2012; Hughes, 2009; Trutnevyte, Stauffacher, & Scholz, 2011). Other studies focus on the emergence of social networks in relation to renewable distributed power generation (Berkhout & Westerhoff, 2013; Parag, Hamilton, White, & Hogan, 2013). We investigate the developments, focus and highlights of the community energy literature by critically reviewing the recent studies that appeared in academic journals.

In this respect, we found that there already are some studies, which investigate a particular aspect of this emergent energy literature. For example, Yildiz et al. (2015) compare energy cooperatives in Germany with investor-oriented firms, using insights from diverse strands of the economic literature, with the aim of setting a research agenda. Furthermore, they review literature from the social sciences on the topic of participation and civic engagement, as well as highlighting intra-cooperative dynamics concerning conflict and trust. Fast (2013) reports on a literature study into social acceptance of renewable energy and investigates the possible role of geography in this discussion. He follows Wüstenhagen et al. (2007) in distinguishing between socio-political, market and community acceptance. Fast finds that the level of acceptance is generally higher if the public has a role as investor or co-owner of the facility. De Boer et al. (2015) study the literature regarding the spatial impacts of renewable energy, in particular direct land use impacts, aesthetic impacts, recreational and ecological impacts. De Boer et al. zoom in on the structural conditions of



renewable energy, in particular biophysical conditions, while the aesthetic impacts relate to the community acceptance discourse, as also investigated by Fast (2013) and Wüstenhagen et al. (2007). Van den Bergh et al. (2011) focus on theoretical approaches used in the sustainability transition literature. They identify four broad systems approaches, namely innovation systems, multi-level perspective, complex systems, and evolutionary systems and organize the literature accordingly. We depart from their framework regarding the community energy literature and try to account for the existing approaches.

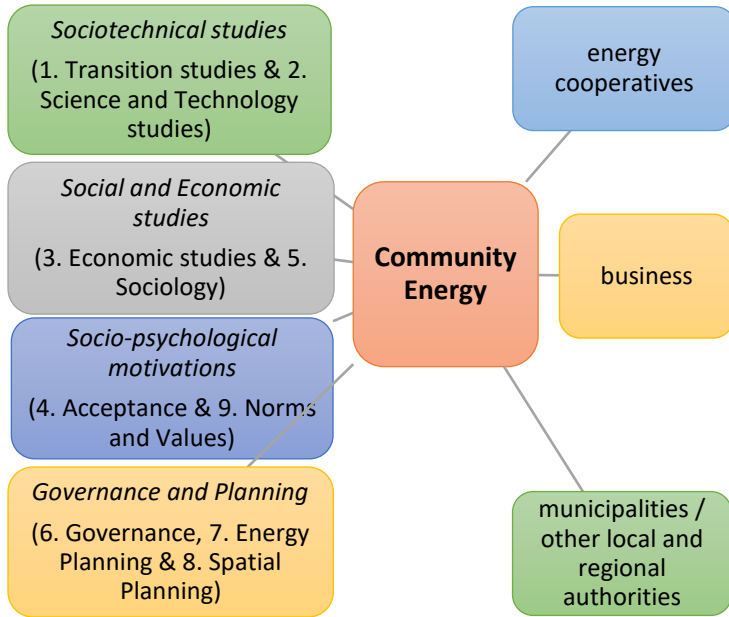
Other studies that are closely related are Ribeiro et al. (2011), who reviewed nineteen studies regarding the impact of social sustainability on electricity planning. They find 101 social, economic or environmental impacts of electricity plants in this study, for example referring to employment, health, noise, visual effects, land cover (although a quarter of the reviewed studies are literature reviews themselves, which probably adds to the number of impacts found). One of the emerging impacts identified in this study is social acceptance, including NIMBY-ism. Rae and Bradley (2012) reflect on energy autonomy and identify a list of key issues. Their contribution is that they explore the characteristics of sustainable communities. They identify four key issues on the basis of their study of the literature: 1. The degree and scale of energy autonomy; 2. Matching demand with supply; 3. The importance of socio-economic and political factors; 4. Energy autonomy in island and remote communities. Community energy is discussed under key issue 3, including community ownership and stakeholder's engagement, the role of policy and the impact of economics and project finance. We study these issues in section 4, where we discuss the theoretical approaches to community energy.

Another take on the subject is provided by Wolsink (2012), who focuses primarily on the social aspects of smart grids. He treats renewable energy grids as a 'common pool resource' (CPR). According to Ostrom and others, "collaborative planning and community involvement are key for effective implementation by and community support for renewable energy projects" (Wolsink, 2012, p. 830). Wolsink proposes a research agenda and recommends ensuring that social acceptance is taken up in the design of smart grid policies. Further, we refer to the study of Beynaghi et al. (2015), who executed a search in Scopus with the search terms sustainability and sustainable development in two separate years: 2000 and 2013. They show the texts of the top 5% of the resulting articles in a word cloud. Comparison of these word clouds leads them to conclude that a large increase in studies relating to energy has taken place from 2000 to 2013. Within energy studies, a shift to renewable energy is evident. Key issues and trends regarding integrated community energy systems (ICESs) are outlined by Koirala et al. (2016) in a broad literature review on the basis of a total of 1285 studies derived from Scopus. They highlight technical, environmental and institutional issues that apply to local systems. Lastly, Klein & Coffey (2016) review the theoretical basis for community energy as well as a literature overview of technological options and geographical focus of 70 community energy studies.

As to the research method and philosophy, we want to point out that transdisciplinary research is increasingly seen as crucial in the implementation of sustainable development (Pouw & Gupta, 2017). Such approaches open up new ways for 'sustainability learning' (Cornell et al., 2013) in relation to energy transition. Therefore, building on Hirsch Hadorn et al. (2006), we will position community energy between academic disciplines on one side, and the perspectives

of non-academic stakeholders on the other. Inspired by Turnheim & Geels (2012), we further cluster the nine approaches into four societal domains: sociotechnical studies, social-economic studies, governance and planning studies, and socio-psychological studies. This shows the interconnectedness of community energy activities with global and local networks of human actors and technologies. The right-hand side of Figure 1 depicts the different categories of stakeholders, the left-hand side has the nine different theoretical approaches we will be studying, grouped under four more generic headings. The approaches are detailed in section 4.2, where we will also use them in the analysis as the different approaches arrive at different views about and recommendations for energy policy.

**Figure 1. Academic domains and stakeholders of community energy research**



Our aim is to complement these studies by providing a more encompassing and systematic approach of the community energy literature. Further, we want to perform a critical review of this literature and to draw conclusions on what theoretical perspectives are used, to what extent commonalities and differences can be found between the main countries about which community energy studies have been undertaken, and how to proceed to better understand patterns of local energy transitions. To this extent, we first provide an overview of the timeline of appearance of community energy studies in the literature, the geographical orientation of more than 250 studies,

and the journals that published the articles. We also provide an encompassing overview of their characteristics and about the theoretical perspectives employed. We then analyse these approaches in relation to the keywords used to assess these approaches as well as the focus and research design of the studies. Lastly, we relate the different approaches to the country specifics of the case studies. In the conclusion, we reflect on the state of the literature about community energy and identify topics for further research. As such, we provide an encompassing overview of the what (keywords), where (countries), when (years), by whom (journals) and why community energy is studied.

## **1. Research design**

In order to evaluate the contribution of community energy to the energy transition, we perform a literature search in Scopus for the period 1997 to 2018 (for this end year, we have data for January-February only). We start in 1997, which saw the Kyoto Protocol that gave rise to new energy policies in most of the countries involved with this international agreement about greenhouse gas emissions (Bagozzi, 2015). At the same time, the liberalisation of the energy sector created opportunities for citizens in their choice of their energy provider (Smil, 2005). Moreover, prices of solar panels dropped considerably, bringing solar technology within the reach of individual house owners.

The phenomenon of community energy not only relates to a technological transformation of the energy system into a system based on renewables, but also to a more diversified and decentralized system where communities aim at considerable control of their own energy generation and provision. The latter is central in the community energy studies. For our literature search, we proceeded as follows. We initially used the search terms ‘community energy’ and ‘renewable’. However, it showed that the terminology used to describe community energy activities appeared to be very varied. Therefore, we extended our search with the search terms decentralized energy, community engagement and local energy. Furthermore, we used keywords found in these articles that directly relate to our subject as a further search term: low carbon communities, local energy governance, community action, decentralised energy, grassroots innovations, renewable energy, sustainable energy, and energy autonomy. In addition, we fine-tuned the corpus to studies concerning citizens, local and regional projects. We included articles focusing on local governments, if

citizens were involved in a meaningful way. We excluded papers that do not account for an active role of citizens. In order to limit our material to peer-reviewed articles, we excluded working papers, proceedings and book chapters. As a result, we ended up with 263 studies, which is the corpus of studies on which we will perform the review. These sample studies are all listed in Appendix A, which displays authors, title, journal, publication year, country of study, used keywords and theoretical approaches. Corpus-articles that are discussed in the text are indicated with the usual reference and a number according to Appendix A. Corpus articles that are referred to in the main article are included in the reference list.

We analysed the resulting list of research articles with Atlas.ti, which allowed us to identify keywords and search for theoretical frameworks and geographical names in the articles as a whole. Our findings provide an overview of the literature about community energy initiatives, both initiated by citizens and municipalities. We focused on keywords, theoretical approaches and country distribution.

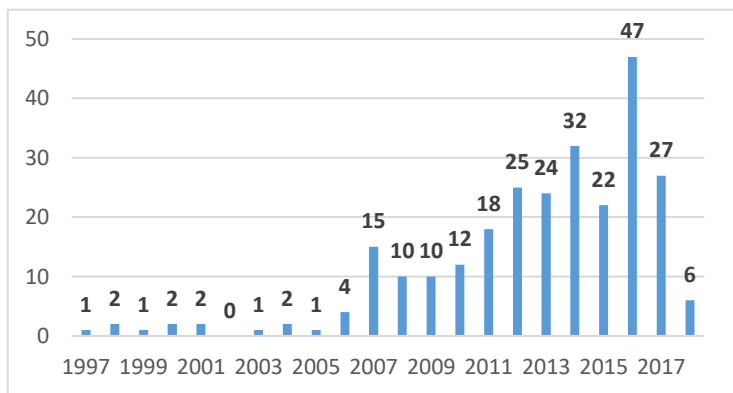
## **2. Characteristics of the community energy studies**

This section gives an overview of the descriptive characteristics of the studies regarding community energy that resulted from our screening process as described in the previous section. The key characteristics of the 263 studies investigated are the time of appearance in the literature, the geographical orientation of the studies, and the journals that publish community energy studies.

Figure 2 shows the development regarding the publication of the articles of interest in our review. Please note that the data for 2018 is only for the first two months. The first paper in our literature review

appears in 1997 written by Jaccard et al. (1997)/c136 in Energy Policy, regarding community energy management. Since then, there has been published at least one article every year that fulfils our criteria, with the exception of 2002. Figure 2 shows that the topic of community energy took off in 2007. This is the first year when more than five articles did appear. This has been the case since then. Until 2007, for a period of 10 years, which constitutes almost half of our sampling period, only six percent of the studies did appear. The other 94 percent saw publication in the remaining twelve years. Further, it shows that most studies have been published in the last four years, with 2016 being the year with the largest number of publications: more than one out of six studies in our sample was published in this year. The studies published in 2014-2017 make up almost 50% of our total sample (i.e., the corpus of 263 articles).

**Figure 2: Year of publication of studies on community energy and number of studies published (vertical axis)**

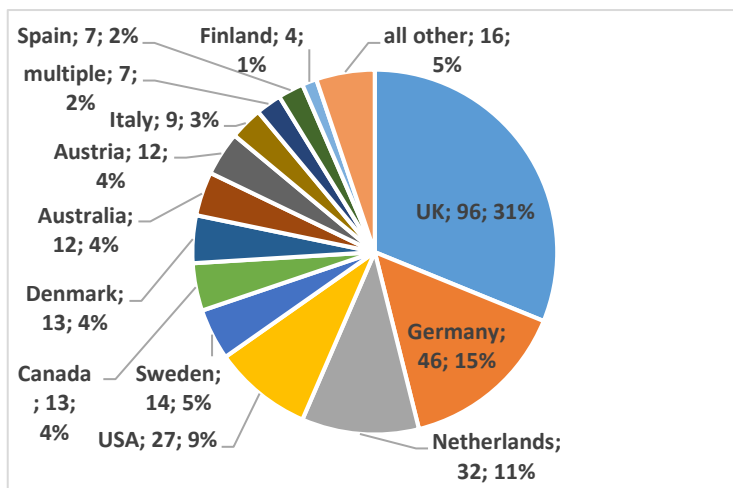




Selection of the studies is based on the following search terms: *community energy, renewable, decentralized energy, community engagement, local energy, low carbon communities, local energy governance, community action, decentralised energy, grassroots innovations, renewable energy, sustainable energy, energy autonomy, and local government.*

The majority of the papers in the community energy literature rely on the case study approach and focus on one or more specific countries. More specifically, we encountered 308 cases. The geographical distribution of the cases studied shows in Figure 3. This number (i.e., 308) is more than the total number of studies (i.e., 263) due to the fact there are several case studies that make a comparison between two or more countries. Figure 3 shows that most case studies, namely almost one third, are about community energy in the UK. Germany, the Netherlands and the US rank second, third and fourth in this respect. Combined, more than two thirds of all case studies investigate community energy in one of these four countries. This reveals there is a substantial geographic bias in the community energy studies. The focus on these four countries is a bit of a surprise as only Germany produces a substantial part of its energy consumption with renewables. Further, Germany is the only country of the four where community initiatives are responsible for a considerable part of the renewable energy generated. Lastly, it is remarkable that Denmark, which is often quoted as an example of successful policies for implementing renewable energy hardly turns up in our searches.

**Figure 3: Geographical distribution of the 308 case studies  
(country; number of studies; percentage of total sample)**



The 263 studies appeared in 82 journals, which implies that the average journal has 3.2 articles. However, of course, their appearance is very skewed: There are 51 journals that published just one single study on community energy, and there are 14 journals that published two studies. Together, these 65 journals with either one or two studies published 30% of all studies on community energy in our sample. Table 1 is an overview of the journals that published studies on community energy. It reveals that most studies appeared in Energy Policy (namely one out of every six studies published). The journal ranking second (Local Environment) published 9.5% of the studies, and the third (Energy Research and Social Sciences) 8.4. Thus, combined these three journals published 25% of all articles on community energy in the period studied. The runners-up are

Sustainability, Energy, Sustainability and Society, and Renewable and Sustainable Energy Reviews, which together published 40 community energy articles or 15,2% combined. These characteristics reveal that the community energy debate is taking place in only a small number of journals. This is a typical characteristic of emergent fields of study.

### **Explanation Table 1, p. 18, 19**

The first column gives the number of publications in a journal. The second column gives the number of journals that held this number of publications. The third column gives the names for the journals that published three articles or more on community energy in 1997-2018; for the sake of brevity, we do not provide the names of the 51 journals with one article and for the 14 journals with two articles, please see to Appendix A. The fourth column shows the total number of articles that appeared in these journals. The fifth column shows the percentage of the articles in these journals in relation to the total number of articles (i.e., 263). The last column is the cumulative percentage of the articles published in the journals.

**Table 1: Frequency of publications about community energy and journal.**

Number of community energy articles	Number of journals	Journals	Number of articles (column 1 * column 2)	% of articles in relation to total sample	Cumulative % of articles published
(1)	(2)	(3)	(4)	(5)	(6)
1	51	Not disclosed, see Appendix A	51	19.39	19.39
2	14	Not disclosed, see Appendix A	28	10.65	30.04
3	4	Futures; Geography Compass; Global Environmental Change; Research Policy	12	4.56	34.60
4	2	Environment and Planning C; Local Economy	8	3.04	37.64
5	1	Bulletin of Science, Technology	5	1.90	39.54
6	1	Geoforum	6	2.28	41.83
7	2	Environment and Planning A; Journal of Cleaner Production	14	5.32	47.15
9	1	Environmental Innovation and Societal Transitions	9	3.42	50.57

10	1	Renewable and Sustainable Energy Review	10	3.80	54.37
12	1	Energy, Sustainability and Society	12	4.56	58.94
18	1	Sustainability	18	6.84	65.78
22	1	Energy Research and Social Sciences	22	8.37	74.14
25	1	Local Environment	25	9.51	83.65
43	1	Energy Policy	43	16.35	100%
	82		263	100%	

### 3. Results

Here, we report and discuss the analysis regarding the focus and the scientific scope of the community energy studies. To this extent, we first provide an inventory of the keywords. Then, we provide an inventory of the different theoretical approaches assess their use. Next, we relate the approaches to the keywords. Last is that we investigate which approaches are used regarding the country case studies.

#### *4.1 Keywords in the community energy literature*

In this section, we show the keywords used. To this extent, we investigated the keywords provided with the studies. Not all articles did do so as this might be journal specific. Hence, only studies with keywords are included in this analysis.

Most studies provide two or three keywords, but there can be up to six keywords. Please do realize that there are no strict guidelines about what should be a keyword. This means that different authors will have

different ideas in mind when they do provide their keywords. Further, journal practices regarding keywords differ too. Some limit them two three, others to five. Some journals provide a list of keywords from which authors have to choose, whereas others do not limit the number keywords. Nevertheless, we feel that investigating keywords helps us to specify what the literature does and where it is actually interested in.

In total, we encountered 670 different keywords in the sample of 263 studies. Appendix B lists all keywords encountered in this literature. We provide a summary of frequency and occurrence in Table 2. This table shows that the number of keywords used is very skewed indeed. We identified the usage 1090 keywords in total. This implies that on average a keyword is used in 1.6 cases only. There are five keywords (renewable energy, community energy, energy transition, climate change) that together account for 12% of the occurrences. There are 530 keywords that only appear once. This shows that of the 670 keywords, 79% appears just in one instance. These keywords make up almost half (namely 49%) of the total keyword occurrence.

The emergence of the study of energy communities can be held responsible for the extremely wide dispersion as 49% of the keywords provided is only used on one occasion in the literature. This implies that about half of the keywords is used in more than one article. But the distribution is very skewed: 83 keywords are used in two articles, which mean they occur in 166 occasions; 21 keywords are used in three articles, etc. The keyword used most ('renewable energy') was used in 52 articles. The keyword ranking second in this respect is 'community energy' and the third keyword is 'energy transition'. This leads us to conclude together these three dominant keywords qualify the main

topic of this research domain. If the permutations with these keywords, as in ‘community renewable energy’ or ‘sustainable energy’, are grouped in clusters of similar keywords, this trend is even stronger. Worth mentioning are the keywords denoting theoretical outlooks, such as grassroots innovations, multi-level perspective, or niche management (each used in 9 articles).

In our view, the large number of keywords is very interesting as it shows that community energy studies relate to widely different issues. The lack of a clearly identifiable list of keywords in most studies also suggests that community energy studies is a field in progress and by far a coherent sub-discipline yet.

### **Explanation Table 2, p. 23**

The first column gives the frequency (F) of the keyword. The second column gives the keyword(s) used with this frequency in case it is at least five. In order to have a concise table, we did not include the keywords that were used less than five times, as this would result in 545 keywords. The third column has the number of keywords that appear with frequency F. The fourth column is the product of columns 1 and 3 and shows the occurrence of keyword(s) with frequency F. Column 5 relates this product to the overall number of keyword(s) with frequency F that occur in the literature (i.e. 1,090) as gives the percentage of occurrence of this keyword. The last column cumulates these percentages.

**Table 2: Occurrence of the number and percentage of keywords**

Frequency of key-word (F)		Number of keywords with Keywords ( $\geq 5$ )	Occurrence of keywords with frequency F	% occurrence of keywords with freq.F	Cumulative % of occurrence
(1)	(2)	(3)	(4)	(5)	(6)
1	530 words	530	530	48.62	48.62
2	83 words	83	166	15.23	63.85
3	21 words	21	63	5.78	69.63
4	11 words	11	44	4.04	73.67
5	cities; energy efficiency; Germany; justice	4	20	1.83	75.50
6	civil society; energy policy; local government; policy; sustainability; transition		36	3.30	78.81
7	energy cooperatives; sustainable energy	2	14	1.28	80.09
8	participation; sustainable development	2	16	1.47	81.56
9	community renewable energy; energy; governance; grassroots innovations; multi-level perspective; strategic niche management	6	54	4.95	86.51
17	climate change	1	17	1.56	88.07
18	community	1	18	1.65	89.72
27	energy transition	1	27	2.48	92.20
33	community energy	1	33	3.03	95.23
52	renewable energy	1	52	4.77	100.00
		670	1090		



#### *4.2 Theoretical approaches*

Community energy studies show a wide variety of theoretical approaches and is studied within social science disciplines such as sociology, social-psychology, economics, and social geography. Community energy organisations are examined from various angles. Local initiatives make use of existing technologies, adapt them to their needs and/or stimulate the development of new (variants) of technologies. Local energy initiatives are interpreted as a firm, an organisation, an ad-hoc grouping of individuals, or as nodes in a regional network. Further, the individual members or initiators of community energy organisations are seen as moral agents, as end-users, as prosumers, entrepreneurs or voluntary workers. In addition, it has to be acknowledged that national and local policies can be an important incentive, but also a serious obstacle for community energy action. In several cities and regions, examples of energy and spatial planning are investigated.

Van den Bergh et al. (2011) detected four main approaches in transition studies and encouraged researchers to elaborate on this. We did so for community energy and arrive at nine approaches being employed. Inspired by Turnheim & Geels (2012), we further cluster the nine approaches into four societal domains: Sociotechnical arrangements, social-economic studies, political and planning studies, and socio-psychological motivations. This shows the interconnectedness of community energy organisations with global and local networks of human actors and technologies. In figure 1, the nine identified approaches are divided over four societal domains.

Here, we first investigate the theoretical and disciplinary approaches. Then, in section 4.3, we will connect these approaches to the keywords employed in community energy. In section 4.4, we will

investigate which approaches are used to study community energy in the main countries of interest in the literature (i.e. UK, US, Germany, the Netherlands).

Our paper highlights frameworks that are used by more than five studies; smaller groups are clustered as will be described below. For each approach, we identify important studies, specific topics and typical keywords. Table 2 lists the approaches, refers to the sample articles and shows the absolute and relative frequency of the approaches employed in the sample period. This table shows that most studies fall in the categories of Governance and Sociological studies. Together, they make up one third of all studies. Together with studies on Transition and Energy Planning, they make up almost two thirds of all 263 studies.

**Table 3: Approaches in the community energy literature**

Approach	Articles with the approach (numbers refer to the article in the corpus – see Appendix A)	Frequency (number of articles)	% of total sample
(1)	(2)	(3)	(4)
Transition	28, 30, 37, 44, 45, 73, 80, 82, 83, 86, 89, 90, 106, 107, 109, 115, 116, 129, 131, 140, 159, 160, 164, 174, 188, 207, 209, 210, 212, 219, 220, 221, 226, 239, 241, 242, 243, 244, 260	39	14.8
Science and Technology	11, 65, 110, 139, 175, 177, 178, 203, 206, 227, 245, 247, 248, 251	14	5.3
Economic	21, 23, 26, 27, 34, 49, 51, 53, 54, 56, 67, 68, 74, 88, 96, 104, 105, 113, 138, 147, 154, 166, 195, 198, 199, 225, 240, 261, 262	29	11.0
Acceptance	6, 17, 50, 58, 60, 69, 71, 77, 169, 183, 189, 191, 205, 211, 213, 217, 259, 263	18	6.8
Sociology	4, 5, 7, 9, 22, 24, 36, 63, 81, 94, 102, 108, 114, 120, 121, 122, 123, 124, 142, 146, 149, 153, 162, 163, 167, 173, 179, 181, 193, 194, 197, 204, 208, 222, 229, 232, 235, 238, 246, 249, 257, 258	42	16.0
Governance	8, 10, 14, 25, 29, 32, 33, 40, 41, 42, 43, 47, 76, 84, 85, 87, 97, 98, 103, 112, 117, 125, 127, 130, 143, 150, 151, 156, 157, 158, 161, 165, 170, 172, 176, 186, 187, 190, 201, 214, 218, 228, 236, 252, 253, 254	46	17.5
Planning	1, 13, 15, 19, 31, 46, 48, 55, 78, 79, 92, 95, 99, 101, 111, 128, 132, 134, 135, 136, 141, 144, 145, 152, 168, 171, 182, 185, 202, 223, 224, 230, 231, 233, 234, 256	36	13.7
Spatial	18, 39, 57, 61, 64, 66, 72, 196, 237	9	3.4

Norms	2, 3, 12, 16, 20, 35, 38, 52, 59, 62, 70, 75, 91, 93, 100, 118, 119, 126, 133, 137, 148, 155, 180, 184, 192, 200, 215, 216, 250, 255	30	11.4
		263	100.0

Column 1 is the label of the approach. Column 2 reports the articles that are using this approach (number refers to number in corpus, Appendix A). Column 3 shows the number of articles that use this approach. Column 4 reports this number as a percentage of the total number of studies.

#### *4.2.1 Transition studies (39 studies)*

The community energy movement aims at the transition to a sustainable energy system. Therefore, we will start our categorization of approaches with Van den Bergh et al. (2011), who identifies four broad clusters of systemic approaches: innovation systems, multi-level perspective (MLP), complex systems and evolutionary systems. These approaches use specific key concepts and have a related policy view. However, Van den Bergh also recognizes that the boundary between approaches is not very sharp and that there is considerable overlap in concepts. The group ‘Transition studies’ combines studies drawing on Evolutionary systems (3 studies), Grassroots Innovation (6 studies), Innovation systems (3 studies), Multilevel perspective (17 studies) and Strategic Niche management (12 studies). The group contains 39 articles. It appears that the phenomenon of community energy so far does not attract much interest from researchers using Innovation systems and Complex systems as a framework, while Evolutionary systems also is used scarcely to analyse community energy. A much more popular systemic approach in this respect is the multi-level perspective (MLP), which was grounded by Geels (2002, 2011). From this approach strategic niche management (SNM) was derived, to

apply MLP in policy development (Schot & Geels, 2008). In our sample, several authors conceptualize local communities as a niche, a protected space that according to the MLP scheme will influence the current regime. Seyfang et al. (2014)/c208 position communities as a specific niche: ‘grassroots’. The grassroots metaphor has attracted new followers, for example Martiskainen et al. (2017)/c159 study leadership in community energy, and in (Martiskainen, Heiskanen, & Speciale, 2018)(c160) they position grassroots innovations as forms of political engagement. Yalcin-Roillet studies grassroots initiatives in France. Furthermore, Fudge et al. (2016)/c86 focus on local governments and their activities in the role of niche actors. The second level in MLP is called ‘regime’, consisting of clusters of incumbent actors, institutions and policies that protect the status quo. Berlo et al. (2017)/c30 take this perspective in a study of the German Energy regime. An attempt to combine Social Practice Theory with MLP is performed by Hargreaves et al. (2013)/c107.

#### *4.2.2 Science and Technology studies (14 studies)*

Studies focusing in particular on the interaction between technology and human actors or users are listed as a separate group, namely Science and Technology studies (STS). They typically take socio-technical configurations as their starting point. This group contains 14 articles. For example, Palm (2006)/c177 investigates municipalities, focusing on power in the policy process of energy systems, understood as a Large Technical System. Palm et al. (2016)/c178 use the concept of the ‘system builder’ to study municipally owned energy companies in Sweden. Strunz (2014)/c227 studies the German energy transition as a regime shift from a fossil-nuclear - to a renewables-based energy system, setting the resilience framework as an alternative (non-linear

and non-hierarchical) for the MLP. Hauber & Ruppert-Winkel (2012)/c110 study socio-technical change and identify three phases of regional energy transformations: pioneer phase, pivotal network phase and extended network and emerging market dynamic phase.

Socio-technical configurations also are the departing point for Walker & Cass (2007)/c249 in their study of the multiple roles of 'the public' in renewable energy implementation. Energy technology 'hardware' comes in different sizes and can be categorized in five 'modes of implementation': public utility, private supplier, community, household and business. They relate these modes and technologies with underlying discourses, size, management and infrastructural aspects. The meanings of community renewables are further explored by Walker & Devine-Wright (2008)/c250, evaluating how we can understand dimensions of process and outcome of community renewable energy projects. Van der Schoor & Scholtens (2015)/c203 investigate 13 cases of local community energy initiatives, evaluating their activities against dimensions of relations with outside networks and commitment of local actors as proposed by Law & Callon (1992). Ornetzeder & Rohrer (2013)/c175 explore the possibilities of user participation in the development of sustainable energy technologies. They investigate cases where local user groups were instrumental in both development and dissemination of solar collectors and biomass heating systems. Viitanen et al. (2015)/c245 report on two low-carbon communities, where ICT systems are used to facilitate community-based governance of energy, involving users as active agents in design of the systems.

#### *4.2.3 Economic studies (29 studies)*

The third group we identify consists of ‘Economic studies’, which take the economic aspects of community energy as their starting point. These studies usually focus on the economic, social and financial viability of community energy projects and go into the market share of renewable energy in relation to the domestic power or primary energy markets (e.g. Blokhuis et al. (2012)/c34, Del Rio & Burguillo (2008)/c67, Steenhuisen & de Bruijne (2015)/c225. Topics that are investigated include energy network companies and utilities (Blokhuis et al., 2012)/c34, (Heiman & Solomon, 2004)/c113, (Graichen, Requate, & Dijkstra, 2001)/c96), economic benefits (Hanley & Nevin, 1999)/c105, (del Río & Burguillo, 2009)/c68, (Callaghan & Williams, 2014)/c49, organizational design (Kunze & Busch, 2011)/c147), business studies (Chen, Duic, Manuel Alves, & da Graça Carvalho, 2007)/c56), and economic-sociological analysis (Rydin et al., 2015)/c198. Investigating the type of ‘firm’ community energy initiatives constitute, Yildiz et al. (2015)/c262 compare local cooperatives with investor-oriented firms. Becker et al. (2017)/c23 interpret community energy initiatives as social entrepreneurs, analysing ownership and organisation types, while Magnani et al. (2017)/c154 study the initiatives as ‘ecopreneurs’. Lastly, Sagebiel et al. (2014) /c199 investigates if consumers are willing to pay for energy produced by community cooperatives. This group combines economic studies and business analysis (27) and studies based on alternative economic views e.g. localism (2). The group contains 29 articles.

#### *4.2.4 Acceptance perspective (19 studies)*

Studies from environmental psychology have investigated specific behavioural aspects and drawn our attention to the acceptance of renewables. In our view, this approach is not only a research topic, but is used to categorize phenomena primarily on the dimensions of acceptance and resistance as well. In relation to community energy, the main question in this acceptance perspective is if community engagement increases acceptance of renewable energy projects. The influence of community benefits on acceptance is investigated by Wüstenhagen (2007), Wolsink (2012) and others. Simpson (2018)/c217 compares two communities in Australia, analysing the role of champions in social acceptance of solar energy. Reusswig et al. (2016)/c191 investigate local opposition in the small town of Engelsbrand in Germany, using discourse analysis to study local conflict dynamics. In this group we combine studies into acceptance (14) as well as resistance/ NIMBY studies (5), which fit our criteria listed above. The group contains 19 articles.

#### *4.3.5 Sociological approaches (42 studies)*

Topics that are investigated in the sociological studies are capacities of local actors Middlemiss & Parrish (2010)/c162, development of community initiatives, organisation, and social networks. Van Veelen (2017)/c238 develops a community energy typology to position the Scottish community energy sector. Bauwens et al. (2016)/(c22) examines factors that foster community participation, relying on Ostrom's socio-ecological system framework. Some studies start from 'grounded theory', forming their own theoretical views on the basis of qualitative methods (Hielscher et al., 2013). Kunze & Busch (2011)/c147 investigate seven rural energy projects and identify nine



ideal types of technology application, according to their technical, financial and social complexity. Wüste & Schmuck (2012)/c258 perform a qualitative interview study, looking for the success factors for the implementation of bioenergy villages. Still others draw on future studies (1), social movement studies (3) or perform evaluation research (5). Another relevant theoretical framework in this group is Social Practice Theory (SPT), which looks how social practices, such as cooking, driving or showering, evolve over time. SPT is applied to community energy by Shove et al. (2010) and Hargreaves et al. (2013)/c107. We group these social studies under the heading of 'Sociological approaches'. This somewhat eclectic group of studies contains 42 articles.

#### *4.2.6 Governance studies (46 studies)*

Policy and governance on the municipal or regional level is another important strand within the community energy literature. Many studies pose the question about how to govern the new relations and opportunities that come with the transition to a renewable energy system, especially when this also entails the shift to a decentralized system. Major themes in this literature are the new roles of local government, relations with private actors and the existing energy sector, relations between different levels of governance, and the participation of citizens in municipal governance. It shows that with 46 studies in the corpus, governance is the approach used most in the community energy literature.

The (new) role of local governments is the subject of for example Fudge & Peters (2009)/c85, who report on a study of local government, who encourages community led sustainable development objectives, following several national policy frameworks. This study

investigates the problems in relation to the increasing responsibilities of local governments in this respect. It remains problematic for local governments to foster an effective level of civic engagement. It turns out that key players, such as mayors, can be of great importance for local energy policies (Busch & McCormick, 2014)/c47. Practical renewable energy policies are more relevant to mayors than abstract considerations of climate change or national power supply. According to Monstadt (2007)/c165 new policy approaches and institutional reforms are needed to reshape the local energy system in order to provide for local and regional sustainability needs. To this end, Mårtensson & Westerberg (2007)/c158 identify three strategy models in their study of municipalities (see also Berkhout & Westerhoff (2013)/c29, who identify a lack of integration across scales, which leads to legislative barriers at the local scale). Should municipalities take back ownership and control of local energy provision? In this respect, Becker et al. (2015)/c25 report on this trend of so-called remunicipalisation, which could lead to new forms of urban and energy governance. How energy governance should be organized in the case of collaboration with private sector organisations is investigated by Heldeweg et al. (2015)/c117 in a study of a biogas grid. Safeguarding of public standards and interests is important in these kind of projects, while retaining the advantages of collaboration with private parties. Institutional space of community initiatives is investigated by Oteman et al. (2014)/c176. National configurations of the energy sector strongly influence the institutional space for community initiatives. In Canada, although there certainly is potential for community energy, macro-level politics pose significant challenges, according to MacArthur (2017)/c151. Alignment of discourses between government levels and actors shows to be an important factor in creating

opportunities for community initiatives. Higher-level government support is deemed necessary for further development of community energy in Australia, see Mey et al. (2016)/c161. However, Arentsen & Bellekom (2014)/c10 predict that local initiatives will remain small-scale niches and will have no major impact on the energy system as a whole. National policies in relation to local energy transitions are investigated by Granberg and Elander (2007)/c97, Poupeau (2014)/c187, Hall et al. (2016)/c103, and Bulkeley & Betsill (2013)/c43.

#### *4.2.7 Energy planning (36 studies)*

In this approach, we have grouped 36 articles which investigate municipal or citizen-led energy plans in cities, regions or smaller communities. Jaccard et al. (1997)/c136 explain that the concept of community energy planning (or energy management) combines urban planning concepts with energy management concepts. For example, the design of liveable cities (see also Tozer (2012)/c233 and Krupa et al. (2013)/c145. Ivner et al. (2010)/c135 describe the application of a decision-making model for energy planning. Gustafsson et al. (2015)/c101 report on experiences of 60 participants in a municipalities program initiated by a national agency, concentrating on energy plans and strategies (see also Nilsson & Mårtensson (2003)/c171 and Sperling et al. (2011)/c223. Community energy planning is a complex and time-consuming process, argues Petersen (2016)/c182, which can be supported by methodologies that help to develop energy system variants. Collaborative approaches to energy planning, involving both municipalities and community organisations, are compared for UK and US by Pitt & Congreve (2017)/c185.

Planning for energy autarky is analysed by Madlener (2007)/c152 in a study into wood fuel utilisation for district heating, describing diffusion of biomass heating systems. Schmidt et al. (2012) couple regional energy data with land use information to model energy demand and potentials for biomass supply, striving for energy autarky (see also Abegg (2011)/c1 and Müller et al. (2011)/c168. Further, it shows that multi-criteria Decision Analysis (MCDA) is often used for energy policy analysis to compare renewable energy systems. For example, Wilkens & Schmuck (2012)/c256 study the creation of a bioenergy village (see also Trutnevyte et al. (2011)/c234), Burton & Hubacek (2007)/c46.

#### *4.2.8 Spatial design studies (10 studies)*

Spatial planning and design has landscape design and land use as its primary focus. It shows that there are 10 articles in this category.

According to Crawford and French (2008)/c61 spatial planning involves governance, policy and organisation issues, as well as technical analysis and design. Coenen et al. (2012)/c57 contributes an economic geography perspective to sustainability transitions. Socio-technical developments are embedded within territorial spaces of multiple scales. The geographies of the energy transition in relation to the low-carbon economy are also examined by Bridge et al. (2013)/c39, who discusses the spaces and places of a low carbon future. They suggest six concepts: location, landscape, territoriality, spatial differentiation, scaling and spatial embeddedness. Van den Dobbelsteen (2011)/c72 uses Energy Potential Mapping for developing spatial plans to develop an energy-productive area. This study uses insights from energy planning for spatial design. Barton (1998)/c18 reviews projects that aim to develop self-sufficient (eco-)

neighbourhoods. His conclusions are that community-led projects show the best results, in comparison with municipally led plans, while market-led plans have achieved only limited success. De Waal and Stremke (2014)/c66 explore the challenges and opportunities that the energy transition poses to landscape architects, and how landscape architecture can contribute to the energy transition. They propose the integrative concept of 'sustainable energy landscapes' as a meeting ground for landscape architecture, other disciplines and local communities. Spatial impacts of small-scale renewable energy are investigated by De Boer et al. (2015)/c64.

#### *4.2.9 Norms and values (30 studies)*

What meanings, discourses and values are important in the community energy discourse? How are problems framed and how are justice and equity safeguarded in community energy developments? These are the issues studied by a group of articles which is called 'Norms and values' and contains 30 articles. This group is closely related to the studies in Table 2 belonging to 4. Acceptance and to 5. Sociological approaches. However, the focus on concepts and meanings sets these studies apart.

Especially aspects of justice are investigated in this literature, such as recognitional and distributive justice. Energy and justice is the subject of Catney et al. (2013)/c51, who investigate knowledge networks, and argue for affording greater 'recognitional justice' to different social groups. Costello et al. (2011)/c59 highlight that -next to sustainability principles- also procedural and distributive justice are important principles that should guide an effective governance process. Equal opportunities for communities presently lack policy attention with community energy projects, is argued by Park

(2015)/c180. Adams & Bell (2014)/c2 assess equity and risks in local energy generation projects, testing an energy equity assessment tool in two villages. Simcock (2013)/c215 explores how the justice principle of 'those affected' was utilised to make claims about the fairness of boundaries of two community wind projects. The environmental justice framework is applied by Breukers et al. (2017)/c38 in a study of participation in deprived neighbourhoods. Especially on the topic of justice there is some overlap with the Acceptance approach, where it is expected that better attention to justice will increase public acceptance.

The concept of 'carbon capability', which refers to the meanings, knowledge and skills associated with energy and climate, is explored by Whitmarsh et al. (2011)/c255. This survey shows that carbon capability in the general public is limited, both in individual day-to-day decision-making and in civic and community engagement. The concept of community, its narratives and rhetoric, is examined by Aiken (2012)/c3 and Bailey et al. (2010)/c12. Mälgård et al. (2014)/c155 study how the transition movement ideology created the 'constructed landscape' of a transition initiative. Environmental concern and place attachment are important for similar grass-root initiatives. Phillips & Dickie (2015)/c184 investigate carbon dependency, awareness and actions in four villages, focusing on the way that narratives account for the gap between awareness and action. They find five narratives of non-transition or stasis, and three narratives of transition. Eaton et al. (2014)/c75 study sociotechnical imaginaries of bioenergy, with empirical material from four northern Michigan communities. Collective action frames are developed to account for differing meanings and interpretations of woody biomass usage. Bomberg & McEwen (2012)/c35 did a qualitative study of 100

community energy groups and apply resource mobilization theory to energy studies, and identify two sets of resources: structural and symbolic. The motives of individual consumers to generate their own electricity are investigated by Leenheer et al. (2011)/c148); environmental concerns prove to be the main driver, next to affinity with technology and energy and the reputation of electricity companies.

Public values are the subject of a study by Hoffman et al. (2013)/c124. Community energy programmes often generates a lot of local debate about the development process, the choice of technology, and the spatial siting of the project. Findings include that a bottom-up approach is likely to foster community dialogue, while a top-down approach can reach behavioural impact.

#### *4.3 Theoretical approaches and keyword identifiers*

For each of the nine approaches discussed in section 4.2, we investigate what typical keywords are used. Of course, the more general keywords and identifiers appear in all approaches, but here we want to investigate what makes a particular approach special. This helps us to identify the focus of the respective approach. To this extent, in Table 4, we list typical keywords that refer to specific theoretical concepts related to the identified approaches. Please do realize that these are not the keywords that are used most, because the most frequent keywords tend to be connected to the dimensions of our topic, i.e. climate change, community and renewable energy.

The keywords of Transition studies (group 1 in Table 3) show a strong connection to its related theoretical frameworks and accompanying concepts, such as multilevel perspective, niches and regimes. The Science and Technology group (2) favours socio-

technical configurations, technology assessment and user-led innovations, reflecting less deterministic and more bottom-up concepts. The Economics group (3) relates to keywords related to topics such as ownership, companies, utilities, but also critique on neoliberalism. The Acceptance approach (4) has acceptance, resistance, but also public awareness, public opinion as keywords. Sociological approaches (5) show keywords related to organisation and process, while participation and agency also refers to the bottom-up actions of citizens. Governance (6) keywords show the institutional and governmental aspects, for example in citizenship, authorities and governance. Energy planning (7) has a strong systematic perspective and includes concrete technology choices and calculations. Spatial design (8) has typical keywords relating to landscape, urbanism and spatial and urban planning. Norms and values (9) relate to public values, public sphere, and trust. In addition, justice related keywords such as justice, equity are typical for this group.

This analysis shows that the approaches are quite distinct indeed, as the keywords reflect specific research interests and perspectives in the study of community energy. The variety of perspectives contributes to the richness of the literature.



**Table 4: Typical keywords used in theoretical approaches**

<b>Approach</b>	<b>Typical keywords</b>
Transition studies	Energy transition, grassroots innovation, niches, regime, path dependence, energy innovation systems, socio-technical transitions, multilevel perspective, strategic niche management, innovation
Science and Technology	Socio-technical configurations, socio-technical change, constructive technology assessment, user-led innovations
Economic	Economics, markets, neoliberalism, economic development, impact, utilities, companies, ownership
Acceptance	Social acceptance, engagement, environmental awareness, public opinion, resistance, justice
Sociology	Social capital, participation, processual analysis, social resilience, behaviour change, environmental awareness, agency and capacity, organisation
Governance	Governance, institutional arrangements, environmental citizenship, local authorities, local government, collaborative planning, interactive governance
Planning	Energy planning, energy strategy, public participation, energy management, energy policy, community energy planning, municipal energy plans
Spatial	Spatial planning, landscape architecture, urban planning, eco-urbanism, resilience, regional development, sustainable urban development, geography
Norms	Justice, equity, public values, public sphere, procedural and distributive justice, trust, risk, social impacts

#### *4.4 Theoretical approaches and country perspectives*

We also want to find out whether studies after community energy in different countries investigate different topics or use different approaches. This pertains to the role of country specifics. This might be relevant because of the role of communities. In particular, their degrees of freedom to engage in energy transition, the role of renewable energy, and institutional settings differ among the countries studied. To find out, we grouped the literature according to theoretical approaches by country. We first discuss the literature regarding the countries studied most, and then we provide a comparative assessment. In this respect, we focus on four countries: UK, Germany, US, and the Netherlands. Please recall that almost 70% of the case studies investigate community energy in at least one of these four countries (see Section 3, Figure 2).

The *United Kingdom* (UK) is by far the country studied most; no less than 99 studies investigate community energy in the UK. The MLP approach is used in eight studies after the UK. Especially the concept of niches engenders several studies (for example (Seyfang et al., 2014)/c208). Here, local energy initiatives are conceptualized as niches, which according to MLP theory can eventually influence the energy system. This niches approach is challenged by Middlemiss & Parrish (2010)/c162, pointing to the need for communities to have resources and power to adequately influence the energy regime. North (2011)/c173 further investigates the power of ‘green niches’ in his study after social movements and climate activism. Linked to the niche approach is the concept of grassroots, which is however almost exclusively used by Seyfang et al. (2007)/c210. Walker & Cass (2007)/c249 critically reflect on the rigidity of the concepts of niches and regimes, proposing the term ‘mode’ instead, allowing for a greater

heterogeneity. The impacts of community energy for the local economy is investigated for Scotland (Callaghan & Williams, 2014)/c49 and compared to the economic impacts in other countries (Kunze & Becker, 2015)/c146 and (Rydin et al., 2015)/c198. Sociological studies are developed quite well with investigations of a range of cases throughout the UK (Alexander et al., 2007)/c7, (Gormally, Pooley, Whyatt, & Timmis, 2013)/c94, studies of the capacities of local initiatives (Middlemiss & Parrish, 2010)c162 as well as specific studies into networks or support organisations (Parag & Janda, 2014)/c179. Other studies deepen our understanding of the concept of community (Parkhill et al., 2015)/c181, (Walker, 2011)/c248, (Walker, Devine-Wright, Hunter, High, & Evans, 2010)/c251). Saintier (2017)/c200 argues that to achieve energy justice prosumers and community actors should receive more recognition and policy support in the UK as well as the EU. In projects of shared ownership community actors and companies experience a lack of trust, as Goedkoop & Devine Wright (2016)/c93 show. They conclude that trust-building mechanisms are required for shared ownership to become conventional practice.

In *Germany*, the phenomenon of community energy is studied from a wide variety of angles. Especially the *Energiewende*, in relation to local initiatives, is a growing research niche (Moss, Becker, & Naumann, 2014)/c167, /c228). Beveridge & Kern (Beveridge & Kern, 2013)/c32 outline the development, policies and future challenges of the *Energiewende*. Several sociological studies used a grounded theory approach (Hauber & Ruppert-Winkel, 2012)/c110, (Kunze & Busch, 2011)/c147, c259. Some studies after the German energy communities, such as Hauber et. al (2012)/c110, are critically reflecting on MLP as a framework. For example, Strunz (2014)/(c227) contrasts MLP with a resilience framework, thus highlighting aspects of interrelations

between scales that have been underrated in the literature due to MLP dominance. Sühlsen & Hisschemöller (2014)/c228 use an MLP-perspective to study the 'big four', the incumbents' lobbying activities. They argue that the renewable energy sector in Germany is no longer a niche, but is incorporated in the energy regime. Others are using Strategic Niche Management or MLP as theoretical approach ((Hoppe, Graf, Warbroek, Lammers, & Lepping, 2015)/c129, (Koehrsen, 2015)/c140, (Viétor, Hoppe, & Clancy, 2015)/c244. A relatively large proportion of papers in Germany is devoted to economic aspects of community energy. Hall et al. (2016)/c104 discuss the role of financing institutions in relation to community energy, comparing Germany and UK. Doci & Gotchev (Dóci & Gotchev, 2016)/c74 research energy communities as new investors. They compare the risks, opportunities and support structures in Germany and the Netherlands. The economy of renewable energy cooperatives is investigated by Yildiz et al. (2015)/c262) and Kunze & Becker (2015)/c146. Sagebiel et al. (2014)/c199 examines if consumers are willing to pay for energy produced by local cooperatives. Perspectives on community energy projects as (social) entrepreneurs are used by Lastly, the acceptance of local renewables in relation to environmental justice is investigated by Schweitzer-Ries, et al. (2008)/c205 and Zoellner et al. (2008)/c263.

In the *United States*, renewable energy plays only a minor role, according to Heiman & Solomon (2004)/c113. Klein & Coffey (2016)/c138 compiled a database of community energy projects in the US and propose a classification scheme based on financial model. Federal government policies to promote energy efficiency and renewable energy use have been limited (Pitt & Congreve, 2017, p. 281)/c186), and, as a result, local approaches to clean energy are particularly important. This is reflected in the division over theoretical

approaches, where energy planning and governance issues are studied most. Citizen participation is an important strand in the literature from the US. Hoffman & High-Pippert (2010)/c126 focus on the ways to recruit members for local initiatives and sustaining their participation. They further explore civic culture in a collection of case studies in Minnesota, with a view to develop a social architecture for community management of renewable energy technologies (Hoffman, High-Pippert, Peters, & Fudge, 2005)/c125. Furthermore, Hoffman et al. (2013)/c124 study cases in the UK and the USA focusing on public values and public participation, comparing institutionally-directed programmes with citizen-led initiatives. Berry (2013)/c31 extensively studies the energy programs of community organizations in Arizona, focusing on organisational capabilities. Morris (2013)/c166 analyses emerging energy initiatives in Washington DC, focusing on the elements of ownership, governance and sustainable urban place making, which she connects to the theme of 'localism'. Collaboration between local governments and citizens is investigated by Hawkins & Wang (2012)/c112, relating citizen participation with municipal management and support networks. Pitt & Bassett (2014)/c186 executed a survey of 381 small to mid-sized cities in the US, in order to investigate clean energy policies. Another study after cities, investigating Climate Action Plans (CAPs) is executed by Bassett & Shandas (2010)/c19. Specific local case studies are undertaken across the US in Pennsylvania (Feder, 2004)/c78, California (Weil, 2013)/c253, Illinois (Gasteyer & Carrera, 2013)/c88, Texas (Hughes, 2009)/c132 and Michigan (Eaton et al., 2014)/c75. Feliciano & Prosperi (2011)/c79 reflect on low carbon cities, especially focusing on the role of different levels of government, with Broward County, Florida, as empirical case study. Electricity utilities are responsible for

41% of CO<sub>2</sub> emissions in the US. So, how can utilities integrate renewable energy and consumer's choices in their policies? The incumbent electricity utility industry is investigated by Heiman & Solomon (2004)/c113. They compare state policies for renewable sources and discusses green demand and the role of non-profit publicly owned utilities. Byrne et al. (2009)/c48 investigate ideas for a Sustainable Energy Utility (SEU) as a new institutional and community strategy.

In *The Netherlands*, where the MLP approach originated (Verbong & Geels, 2007)/c242), Doci et al. (2015)/c73 investigates the contribution of local energy initiatives as to energy transition. These initiatives are niches, defined as protected spaces for innovation. They stress that these cooperatives are not aiming at technological innovation, but introduce social innovations and new energy production practices. Bosman et al. (2014)/c37 analyse discourses in the energy regime, concluding that there are conflicting storylines within the incumbent regime, which might indicate regime dynamics. The storyline relating to decentralized energy for example is varying widely between regime actors, indicating uncertainty within the regime. Social Practices Theory is used as perspective by Van Vliet et al. (2012)/c239, studying the influence of the Smart Meter on energy related practices in the household. The effects of varying regional policies are investigated by Warbroek & Hoppe (2017)/c252, who compare two Dutch provinces. Socio-technological studies include De Vries et al. (2016)/c65, who focus on user innovations in civic energy communities. If the share of prosumers continues to grow, how will this effect local grids and network management? Bellekom et al. (2016)/c26 suggest that DSOs and energy communities could cooperate in the development of new business models.

To wrap up, regarding the countries studied, the high amount of studies executed in the UK is striking, although Germany is catching up quickly with a host of studies investigating the Energiewende. As the development and impacts of community energy undertakings are quite dependent on local cultural and political conditions and policies, it seems to us that it is important to replicate studies outside the UK. Furthermore, the phenomenon of community energy as such is not equally prevalent in all countries in our sample.

Regarding the country division of the approaches, it is remarkable that the Transitions approach is rather popular in the UK and NL, while in Germany (GER) a broader group of frameworks is used. In figure 3, the geographical distribution for our corpus showed that the majority of studies investigated the UK, with NL and GER coming after that. In the US, the majority of articles involves case studies with a governance or energy planning perspective, which relates to the relative absence of federal energy policies.

### **Explanation Table 5. p. 48, Approaches by country**

Table 5 shows the use of the approaches at the country level. We report for the four countries studied most (UK, Germany, the Netherlands, US) and group all remaining studies as Other. The last two columns show the total use of each approach and are identical with Table 3. Table 5 shows there are remarkable differences at the country level though. With studies for the UK, it shows that the sociological perspective is used most, and the norms perspective is second. Together, these two approaches are used for 40% of the studies for the UK. In contrast, studies on the US mainly relate to Energy Planning and Governance. Combined, these make up more than 55% of the US studies. For Germany, the Economic approach is used most, followed by the Governance approach. Together, these two are used in almost half of all studies on Germany. For the Netherlands, it is Transition Studies and Governance which is used most; together almost 50%. For the other countries, it shows Energy Planning and Governance combined make up about almost 40% of the studies.



**Table 5: Approaches by country**

<b>Approach</b>	<b>UK</b>		<b>GER</b>		<b>US</b>		<b>NL</b>		<b>Other</b>		<b>Total</b>	
	#	%	#	%	#	%	#	%	#	%	#	%
1. Transition studies	12	15,0	6	15,0	1	4,3	6	24,0	14	14,7	39	14,8
2. Science and Technology	5	6,3	3	7,5	0	0,0	2	8,0	4	4,2	14	5,3
3. Economic	3	3,8	11	27,5	4	17,4	3	12,0	8	8,4	29	11,0
4. Acceptance	7	8,8	4	10,0	0	0,0	0	0,0	7	7,4	18	6,8
5. Sociology	18	22,5	5	12,5	3	13,0	2	8,0	14	14,7	42	16,0
6. Governance	9	11,3	8	20,0	6	26,1	6	24,0	17	17,9	46	17,5
7. Energy planning	8	10,0	2	5,0	7	30,4	1	4,0	18	18,9	36	13,7
8. Spatial sciences	4	5,0	0	0,0	0	0,0	2	8,0	3	3,2	9	3,4
9. Norms	14	17,5	1	2,5	2	8,7	3	12,0	10	10,5	30	11,4
	80	100	40	100	23	100	25	100	95	100	263	100

This table reports the theoretical approaches at the country level. In bold it features which approach is used most within this country (respectively other and total). The numbers under the heading # relate to the number of studies that use the particular approach. The numbers under the heading % relate to the percentage of the studies using a particular approach in relation to the total number of studies after this country (respectively other countries and total).

#### **4. Conclusion**

The community energy literature studies the production and distribution of especially renewable and sustainable energy at the level of neighbourhoods, small communities and municipalities and specifically accounts for the contribution of these entities. This sets this literature apart from the technological studies after the transformation of the energy system (Bagozzi, 2015). The community energy literature relies on a wide array of approaches and studies communities in a wide range of countries and regions. This literature has taken off about ten years ago and focuses on the interchange between power generation and distribution, social networks and local institutions. In this paper, we analyse this literature regarding community energy. Based on relevant criteria, we ended up with 263 studies, which appeared in academic journals in the period 1997-2018. The majority of the studies on community energy were published from 2012 to 2017, which proves that it is a relatively new area of research. This is also witnessed by the huge dispersion of keywords. Of the 530 keywords listed with the articles by the authors themselves, it shows that half of them are used only once in the 263 articles. We observed that the articles appeared in 82 academic journals. But the outlets of the articles were highly concentrated with Energy Policy publishing one fifth of all the articles. And 51 journals so far published just one single article on community energy in the period under review. We focused on case studies and establish that most of them investigate the UK, namely one out of three studies. Together with studies about the US, Germany, and the Netherlands, they make up almost 70% of all cases. We also relate the articles to the theoretical approaches employed. Here, it shows that there is a wide variety in approaches used to study community energy. However, four out of nine approaches, governance studies, energy planning,

transition studies, and sociological approaches, make up two thirds of all the studies.

We conclude that the study of community energy is still in its infancy as there is little commonality in the terminology and key concepts used. Moreover, the topic lacks consensus about appropriate theories and common methodologies. Further, the number of outlets is very limited at this stage and the debate is concentrated in a limited number of journals. As mentioned in the introduction, our study is not the first to reflect on the community energy literature (Beynaghi et al., 2015; de Boer et al., 2015; Fast, 2013; Rae & Bradley, 2012; Van Den Bergh et al., 2011; Wolsink, 2012; Yildiz et al., 2015). However, we add value by offering a much more encompassing perspective by systematically analyzing the development of this literature from its beginnings to 2018. Further, we contribute to the existing reviews by interacting the approaches used in the literature to the key interests of the studies as revealed by the keywords. We also relate the approaches used to the main countries studied. This leads to novel and interesting insights from which future research may depart.

The expected or conceivable quantitative contribution of community energy to the energy transition is another topic that is lacking attention from social research. Similarly, the many case studies of municipalities and specific community projects could be supplemented with investigations of the interrelations between local and national policies. Correlation between national energy policies (or the relative absence thereof) and the breadth and impact of community energy is apparent. Therefore, comparative country studies, such as the study of Oteman et al. (2014), regarding the effects of national policy and institutions on the opportunities for community energy, merit more attention in the

literature. Also, studies after community energy in non-developed countries would be very welcome as these are not included in the corpus.

Community energy is studied from a variety of perspectives, delivering insights that range from individual motivations of members to join these groups, the organisation of local community initiatives, their relations with local governments, regional support organisations and networks, to national policies that aim to stimulate decentralized community owned energy production. Studies using MLP have opened significant avenues of studies, conceptualizing community energy as a niche phenomenon. However, MLP as well as the other approaches will have to specify and develop in order to understand and explain community energy. Further, we feel there is room to further reflect on the agency that is employed by local communities and how bottom-up changes in the energy structure occur. We argue that the study and practice of community energy could benefit from a transdisciplinary research approach, which integrates perspectives of multiple academic disciplines and non-academic stakeholders. Moreover, this could lead to policy development that is science-based and practice oriented.

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## Appendix A: Corpus

Nr.	Authors	Journal	Title	Year	Country	TAnr	Theoretical Approach	Keywords
1	Abegg, B.	Mountain Research and Development	Energy self-sufficient regions in the European Alps	2011	Austria	7	Energy planning	energy autonomy; energy self-sufficiency; European Alps; policy; sustainable regional development
2	Adams, C. A.; Bell, S.	Local Environment	Local energy generation projects: assessing equity and risks	2015	UK	9	Norms& Values	community; energy; equity; policy; risk
3	Aiken, G.	Geography Compass	Community Transitions to Low Carbon Futures in the Transition Towns Network (TTN)	2012	UK	9	Norms& Values	none
4	Aiken, G. Taylor	Political Geography	Prosaic state governance of community low carbon transitions	2016	UK	5	Sociology	Low carbon transitions Community transitions Transition towns Prosaic state Number governa...
5	Aiken, G. Taylor	Environment & Planning A	The politics of community, Togetherness, transition and post-politics	2017	multiple	5	Sociology	Low carbon transitions, community, environmentalism, post-politics
6	Aitken, Mhairi	Energy Policy	Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature	2010	none	4	Acceptance	planning; wind; public
7	Alexander, Roy; Hope, Max; Degg, Martin	Local Economy	Mainstreaming sustainable development, a case study: Ashton Hayes is going carbon neutral	2007	UK	5	Sociology	none
8	Allen, Joshua; Sheate, William R.; Diaz-Chavez, Rocio	Local Environment	Community-based renewable energy in the Lake District National Park, local drivers, enablers, barriers and solutions	2012	UK	6	Governance	community; renewable energy; Lake District; planning; partnerships
9	Anzoise, Valentina; Sardo, Stefania	Evaluation and program planning	Dynamic systems and the role of evaluation, The case of the Green Communities project	2016	Italy	5	Sociology	Evaluation; Innovation; Local development; Complexity Dynamic systems; Narratives; Uncertainty
10	Arentsen, M.; Bellekom, S.	Energy, Sustainability and Society,	Power to the people: Local energy initiatives as seedbeds of innovation?	2014	Netherlands	6	Governance	bottom-up innovation; local energy initiative; renewable energy; seedbed of innovation

11	Armstrong, A.; Bulkeley, H.	Geoforum	Micro-hydro politics: Producing and contesting community energy in the North of England	2014	UK	2	Science& Techn	community energy; energy resources; Hexham river hydro; micro-hydro; north of England; politics of community energy production
12	Bailey, I.; Hopkins, R.; Wilson, G.	Geoforum	Some things old, some things new: The spatial representations and politics of change of the peak oil relocalisation movement	2010	UK	9	Norms& Values	peak oil; relocalisation; transition; network; spatial representations; politics of range; hybridity
13	Bale, Catherine S.E.; Foxon, Timothy J.; Hannon,; Matthew J.; Gale, William F.	Energy Policy	Strategic energy planning within local authorities in the UK, A study of the city of Leeds	2012	UK	7	Energy planning	Strategic energy planning; Local government; Energy Service Companies (ESCoS)
14	Barber, Jeffrey	Journal of Cleaner Production	Mapping the movement to achieve sustainable production and consumption in North America	2007	Canada, USA	6	Governance	consumption; production; sustainable; strategies; policy; practices; North America
15	Barbero, Silvia	Design principles and practices	Local Bio-Energy Promotes Distributed Economy for Sustainable Development: Systemic Design Approach and Case-Studies	2010	Sweden	7	Energy planning	systemic design; network of enterprises; small scale production systems; local sustainable development; distributed economies
16	Barr, Stewart; Pollard, Justin	Environment & Planning A	Geographies of Transition, Narrating environmental activism in an age of climate change and 'Peak Oil'	2016	UK	9	Norms& Values	Transition Town Movement; environmental activism; re-localisation
17	Barry, J.; Ellis, G.; Robinson, C.	Global Environmental Politics	Cool rationalities and hot air: A rhetorical approach to understanding debates on renewable energy	2008	UK	4	Acceptance	none
18	Barton, Hugh	Local Environment	Eco-urban neighbourhoods: A review of projects	1998	UK	8	Spatial design	none
19	Bassett,E.; Shandas, V.	Journal of the American Planning Association	Innovation and climate action planning: Perspectives from municipal plans	2010	USA	7	Energy planning	climate action planning; plan evaluation
20	Bauwens, Thomas	Energy Policy	Explaining the diversity of motivations behind community renewable energy	2016	Belgium	9	Norms& Values	Renewable energy Investments Community Institutions Social norms Flanders
21	Bauwens, Thomas Defourny, Jacques	Annals of Public and Cooperative Economics	Social capital and mutual versus public benefit, the case of renewable energy cooperatives	2017	Belgium	3	Economics	Social capital, community, sustainability transition, social economy, renewable energy coo...

22	Bauwens, Thomas; Gotchev, Boris; Holstenkamp, Lars	Energy Research & Social Science	What drives the development of community energy in Europe, The case of wind power cooperatives	2016	Belgium, Denmark, Germany, UK	5	Sociology	Wind power Cooperative Community energy Social-Ecological System
23	Becker, Sören; Kunze, Conrad; Vancea, Mihaela	Journal of Cleaner Production	Community energy and social entrepreneurship, Addressing purpose, organisation and embeddedness of renewable energy projects	2017	Germany, Italy, Spain, UK	3	Economics	Renewable energy Social entrepreneurship Social movements Community energy Energy cooperat...
24	Becker, Sören; Naumann, Matthias	Geography Compass	Energy democracy, Mapping the debate on energy alternatives	2017	none	5	Sociology	none
25	Becker, S.; Beveridge, R.; Naumann, M.	Space and Polity	Remunicipalization in German cities: contesting neo-liberalism and reimagining urban governance?	2015	Germany	6	Governance	remunicipalization; privatization; energy; urban commons; Berlin
26	Bellekom, Sandra; Arentsen, Maarten; van Gorkum, Kirsten	Journal Energy, Sustainability & Society	Prosumption and the distribution and supply of electricity	2016	Netherlands	3	Economics	Prosumption, Residential storage, Peer-to-peer, Business models, Electricity supply compan...
27	Bere, Jemma; Jones, Calvin; Jones, Stuart; Munday, Max	Environment and Planning C: government and policy	Energy and development in the periphery, A regional perspective on small hydropower projects	2016	UK	3	Economics	Community development, cluster growth, community energy, environmental sustainability, sust...
28	Bergman, Noam; Eyre, Nick	Energy Efficiency	What role for microgeneration in a shift to a low carbon domestic energy sector in the UK?	2011	UK	1	Transition Studies	microgeneration; domestic energy; behaviour; transition; socio-technical regime; niches; strategic niche management
29	Berkhout, T.; Westerhoff, L.	Environment and Planning C: Government and Policy	Local energy systems: Evaluating network effectiveness for transformation in British Columbia, Canada	2013	Canada	6	Governance	Canada; climate change; energy; local government; networks; social network analysis; transformation
30	Berlo, Kurt; Wagner, Oliver; Heenen, Marisa	Sustainability	The Incumbents' Conservation Strategies in the German Energy Regime as an Impediment to Re-Municipalization—An Analysis Guided by the Multi-Level Perspective	2016	Germany	1	Transition Studies	transition research; energy transition; re-municipalization; municipal utilities; local po...
31	Berry, David	Environmental Practice	Community clean energy programs: proficiencies and practices	2013	USA	7	Energy planning	none
32	Beveridge, Ross; Kern, Kristine	Renewable Energy Law & Policy Review	Energiewende in Germany: Background, Developments and Future Challenges, The	2013	Germany	6	Governance	none

33	Bhagavatula, Laasya; Garzillo, Cristina; Simpson, Richard	Journal of Cleaner Production	Bridging the gap between science and practice: An ICLEI perspective	2013	none	6	Governance	research; practice; local governments; cities; sustainable development; informed cities
34	Blokhuis, Erik; Advokaat, Bart; Schaefer, Wim	Energy Policy	Assessing the performance of Dutch local energy companies	2012	Netherlands	3	Economics	local energy company; renewable energy technology; data envelopment analysis
35	Bomberg, E.; McEwen, N	Energy Policy	Mobilizing community energy	2012	UK	9	Norms& Values	community energy; resource mobilization; Scotland
36	Boon Frank Pieter; Dieperink, Carel	Energy Policy	Local civil society based renewable energy organisations in the Netherlands, Exploring the factors that stimulate their emergence and development	2014	Netherlands	5	Sociology	Local renewable energy organisation Renewable energy Netherlands Decentralised generation
37	Bosman, Rick; Loorbach, Derk; Frantzeskaki, Niki; Pistorius, Till	Environmental Innovation and Societal Transitions	Discursive regime dynamics in the Dutch energy transition	2014	Germany, Netherlands	1	Transition Studies	destabilization; discourse; energy transition; regime; the Netherlands
38	Breukers, S.; Mourik, R. M.; van Summeren, L. F.M.; Verbong, Geert P. J.	Energy Research & Social Science	Institutional 'lock-out' towards local self-governance, Environmental justice and sustainable transformations in Dutch social housing neighbourhoods	2016	Netherlands	9	Norms& Values	Environmental justice Energy efficiency Path-dependency Institutions Neighbourhood Social...
39	Bridge, Gavin; Bouzarovski, Stefan; Bradshaw, Michael; Eyre, Nick	Energy Policy	Geographies of energy transition: Space, place and the low-carbon economy	2013	UK	8	Spatial design	geography; transition; low-carbon
40	Britton, J.; Woodman, B.	Local Economy	Local Enterprise Partnerships and the low-carbon economy: Front runners, uncertainty and divergence	2014	UK	6	Governance	decentralisation, energy, green growth, Local Enterprise Partnerships, localism, low-carbon economy
41	Brummer, Vasco	Energy Research & Social Science	Of expertise, social capital, and democracy, Assessing the organizational governance and decision-making in German Renewable Energy Cooperatives	2018	Germany	6	Governance	Energy cooperatives Governance Renewable energy Community energy
42	Bulkeley, H.	Public Understanding of Science	Common knowledge? Public understanding of climate change in Newcastle, Australia	2000	Australia	6	Governance	none
43	Bulkeley, Harriet; Betsill, Michele M.	Environmental Politics	Revisiting the urban politics of climate change	2013	Australia, Canada, UK	6	Governance	urban governance; climate change; multilevel governance; politics; transition
44	Burch, Sarah	Energy Policy	In pursuit of resilient, low carbon communities: An examination of	2010	Canada	1	Transition Studies	climate change; capacity; policy

			barriers to action in three Canadian cities					
45	Burnham, Morey; Eaton, Weston; Selfa, Theresa; Hinrichs, Clare; Feldpausch-Parker, Andrea	Geoforum	The politics of imaginaries and bioenergy sub-niches in the emerging Northeast U.S. bioenergy economy	2017	USA	1	Transition Studies	Bioenergy Marginal land Multi-level perspective Object conflict Scale Sociotechnical imagi...
46	Burton, Jonathan; Hubacek, Klaus	Energy Policy	Is small beautiful? A multicriteria assessment of small-scale energy technology applications in local governments	2007	UK	7	Energy planning	small-scale energy technology; Multicriteria decision aid (MCDA); local government
47	Busch, H.; McCormick, K.	Energy, Sustainability and Society	Local power: Exploring the motivations of mayors and key success factors for local municipalities to go 100% renewable energy	2014	Germany	6	Governance	renewable energy; sustainable development; local municipalities; climate change; energy policies; local environmental governance
48	Byrne, John; Martinez, Cecilia; Ruggero, Colin	Bulletin of Science, Technology & Society	Relocating energy in the social commons ideas for a sustainable energy utility	2009	USA	7	Energy planning	energy policy; energy commons; sustainable energy; commonwealth; ecological justice
49	Callaghan, G.; Williams, D.	Local Economy	Teddy bears and tigers: How renewable energy can revitalise local communities	2014	UK	3	Economics	community empowerment;community ownership;local economic development;renewable energy;supply chains
50	Cass, Noel; Walker, Gordon	Emotion, Space and Society	Emotion and rationality: The characterisation and evaluation of opposition to renewable energy projects	2009	UK	4	Acceptance	emotions; engagement; activism; place attachments; renewable energy
51	Catney, Philip; Dobson, Andrew; Hall, Sarah Marie; Hards, Sarah; MacGregor, Sherilyn; Robinson, Zoe; Ormerod, Mark; Ross, Simon	Local Environment	Community knowledge networks: an action-orientated approach to energy research	2013	UK	3	Economics	energy; justice; community; knowledge; networks
52	Catney, Philip; MacGregor, Sherilyn; Dobson, Andrew; Hall, Sarah Marie; Royston, Sarah; Robinson, Zoe; Ormerod, Mark; Ross, Simon	Local Environment	Big society, little justice? Community renewable energy and the politics of localism	2014	UK	9	Norms& Values	none
53	Cebotari, Sorin; Benedek, Jozsef	Sustainability	Renewable Energy Project as a Source of Innovation in Rural Communities, Lessons from the Periphery	2017	Rumania	3	Economics	renewable energy projects; peripheralization; innovation; development



54	Cebotari, Sorin; Cristea, Marius; Moldovan, Ciprian; Zubascu, Florin	Energy for Sustainable Development	Renewable energy's impact on rural development in northwestern Romania	2017	Rumania	3	Economics	RES Rural development Employment Revenues Demographics Agriculture
55	Chatterton, P.	International Journal of Urban and Regional Research	Towards an agenda for post-carbon cities: Lessons from lilac, the uk's first ecological, affordable cohousing community	2013	UK	7	Energy planning	post-carbon, cities, cohousing, low impact, equality, co-operative, community
56	Chen, Fengzhen; Duic, Neven; Alves, Luis Manuel; da Graca Carvalho, Maria	Renewable and Sustainable Energy Reviews	Renewislands, Renewable energy solutions for islands	2007	Denmark, Greece, Portugal, Spain	3	Economics	islands; intermittent; renewable energy supply; hydrogen; integration system
57	Coenen, Lars; Benneworth, Paul; Truffer, Bernhard	Research Policy	Toward a spatial perspective on sustainability transitions	2012	Denmark, Netherlands	8	Spatial design	geographies of transitions; Multi-level perspective; technological innovation systems; economic geography
58	Connors, Phil; McDonald, Peter	Community Development Journal	Transitioning communities: community, participation and the Transition Town movement	2011	UK	4	Acceptance	none
59	Costello, D.	International Journal of Environmental, Cultural, Economic and Social Sustainability	Incorporating community governance: Planning sustainable energy security	2011	Australia	9	Norms& Values	community engagement; decentralized renewable energy; sustainable energy planning; deliberative democracy; procedural and distributive justice; community energy; sustainability planning
60	Cowell, Richard; Bristow, Gill; Munday, Max	Journal of Environmental Planning and Management	Acceptance, acceptability and environmental justice: the role of community benefits in wind energy development	2011	UK	4	Acceptance	renewable energy, community, compensation, justice, planning
61	Crawford, Jenny; French, Will	Energy Policy	A low-carbon future: Spatial planning's role in enhancing technological innovation in the built environment	2008	UK	8	Spatial design	governance; innovation; spatial planning
62	Dampier, Jason Ernest Elvin; Lemelin, R. Harvey; Shahi, Chander; Luckai, Nancy	Energy, Sustainability and Society	Small town identity and history's contribution to a response in policy change: a case study of transition from coal to biomass energy conversion	2014	Canada	9	Norms& Values	bioenergy; Atikokan Generating Station; lignite coal; social impacts; wood pellets
63	Darby, Sarah	Energy Policy	Social learning and public policy: Lessons from an energy-conscious village	2006	UK	5	Sociology	social learning; tacit knowledge; feedback

64	De Boer, C.; Hewitt, R.; Bressers, H.; Martinez Alonso, P.; Hernandez Jimenez, V.; Diaz Pacheco, J.; Roman Bermejo, L.	Energy, Sustainability and Society	Local power and land use: spatial implications for local energy development	2015	Netherlands, Spain	8	Spatial design	integrated modelling; land use impacts; renewable energy
65	De Vries, Gerben W.; Boon, Wouter P.C.; Peine, Alexander	Environmental Innovation and Societal Transitions	User-led innovation in civic energy communities	2016	Netherlands	2	Science& Techn	User innovation User-led technological change User communities Civic energy communities Co...
66	De Waal, Renee M.; Stremke, Sven	Sustainability	Energy transition: Missed opportunities and emerging challenges for landscape planning and designing	2014	Denmark, Germany	8	Spatial design	renewable energy; sustainable energy landscapes; landscape architecture; operational design; strategic design; climate change mitigation; transition management; Güssing; Jühnde; Samsø
67	Del Rio, Pablo; Burguillos, Mercedes	Renewable and sustainable energy reviews	Assessing the impact of renewable energy deployment on local sustainability: Towards a theoretical framework	2008	Spain	3	Economics	renewable energy; regional development; local sustainability
68	Del Rio, Pablo; Burguillos, Mercedes	Renewable and Sustainable Energy Reviews	An empirical analysis of the impact of renewable energy deployment on local sustainability	2009	Spain	3	Economics	renewable energy; regional development; local sustainability
69	Delicado, Ana; Junqueira, Luis; Fonseca, Susana; Truninger, Monica; Silva, Luis; Horta, Ana; Figueiredo, Elisabete	Science & Technology Studies	Not in Anyone's Backyard? Civil Society Attitudes towards Wind Power at the National and Local Levels in Portugal	2014	Portugal	4	Acceptance	renewable energy, public opinion, environmental non-governmental organisations
70	Devine-Wright, P.	Local Environment	Local aspects of UK renewable energy development: Exploring public beliefs and policy implications	2005	UK	9	Norms& Values	none
71	Devine-Wright, Patrick; Wiersma, Bouke	Local Environment	Opening up the 'local' to analysis: exploring the spatiality of UK urban decentralised energy initiatives	2013	UK, Austria	4	Acceptance	decentralised energy; community energy; local; scale; spatiality
72	Dobbelsteen Van Den, Andy; Broersma, Siebe; Stremke, Sven	International Journal of sustainable building technology and urban development	Energy potential mapping for energy-producing neighborhoods	2011	Netherlands	8	Spatial design	sustainable development; Energy potential mapping; energy neutrality; heat maps; spatial planning; regional development; urban planning

73	Doci, Gabriella; Vasileiadou, Eleftheria; Petersen, Arthur C.	Futures	Exploring the transition potential of renewable energy communities	2015	Netherlands	1	Transition Studies	Multi Level Perspective; social niche; social innovation; renewable energy communities
74	Doci, Gabriella; Gotchev, Boris	Energy Research & Social Science	When energy policy meets community, Rethinking risk perceptions of renewable energy in Germany and the Netherlands	2016	Germany, Netherlands	3	Economics	Renewable energy communities Renewable energy policy Investors risk Perception
75	Eaton, Weston M.; Gasteyer, Stephen P.; Busch, Lawrence	Rural Sociology	Bioenergy futures: framing sociotechnical imaginaries in local places	2014	USA	9	Norms & Values	none
76	Emelianoff, C.	Urban Studies	Local Energy Transition and Multilevel Climate Governance: The Contrasted Experiences of Two Pioneer Cities (Hanover, Germany, and Växjö, Sweden)	2014	Sweden	6	Governance	Hanover; local climate governance; low carbon city; multilevel climate governance; urban energy transition; Växjö
77	Fast, Stewart	Geography Compass	Social acceptance of renewable energy: Trends, concepts, and geographies	2013	UK	4	Acceptance	none
78	Feder D,	Professional Geographer	A Regionally Based Energy End-Use Strategy: Case Studies from Centre County, Pennsylvania	2004	USA	7	Energy planning	renewable energy, regional geography, end-use analysis.
79	Feliciano, M.; Prosperi, D. C.	Cities	Planning for low carbon cities: Reflection on the case of Broward County, Florida, USA	2011	USA	7	Energy planning	greenhouse gases; carbon cities; energy; climate change; planning; public policy; Florida; energy efficiency
80	Fischer, Anke; Holstead, Kirsty; Hendrickson, Cary Y.; Virkkula, Outi; Prampolini, Alessandra	Environment & Planning A	Community-led initiatives' everyday politics for sustainability – Conflicting rationalities and aspirations for change	2017	Finland, Italy, UK	1	Transition Studies	Discourses, expectations, grassroots, low carbon, transitions
81	Forrest, Nigel; Wiek, Arnim	Environmental Innovation and Societal Transitions	Learning from success, Toward evidence-informed sustainability transitions in communities	2014	?	5	Sociology	analytical-evaluative framework; community initiatives; sustainability interventions; sustainability transitions; transition pathways/mechanisms
82	Foxon, T. J.	Ecological Economics	A coevolutionary framework for analysing a transition to a sustainable low carbon economy	2011	none	1	Transition Studies	coevolution; transition pathways; low-carbon economy; long-term industrial change
83	Foxon, Timothy J.; Hammond, Geoffrey P.; Pearson, Peter J. G.	Technological Forecasting and Social Change	Developing transition pathways for a low carbon electricity system in the UK	2010	UK	1	Transition Studies	transition pathways; Multi-level perspective; dynamic processes;

								technological innovation systems; UK; energy system
84	Fuchs, G.; Hinderer, N.	Energy, Sustainability and Society	Situative governance and energy transitions in a spatial context: case studies from Germany	2014	Germany	6	Governance	electricity supply; Germany; local initiatives; sustainable energy transitions
85	Fudge, Shane; Peters, Michael	Journal of Integrative Environmental Sciences	Motivating carbon reduction in the UK: the role of local government as an agent of social change	2009	UK	6	Governance	local agenda 21; climate change; governance; local authorities; community engagement
86	Fudge, Shane; Peters, Michael; Woodman, Bridget	Environmental Innovation and Societal Transitions	Local authorities as niche actors, the case of energy governance in the UK	2016	UK	1	Transition Studies	Multi-Level Perspective Local authorities Energy governance Transition Sustainability
87	Gailing, Ludger; Röhring, Andreas	Utilities Policy	Is it all about collaborative governance, Alternative ways of understanding the success of energy regions	2016	Germany	6	Governance	Socio-materiality Power Individuals
88	Gasteyer, Stephen; Carrera, Jennifer	Rural Sociology	The Coal-Corn Divide: Colliding Treadmills in Rural Community Energy Development	2013	USA	3	Economics	none
89	Geels, Frank W.	Theory, Culture & Society	Regime resistance against low-carbon transitions: Introducing politics and power into the multi-level perspective	2014	UK	1	Transition Studies	climate change, electricity, incumbent regimes, resistance, transitions
90	Geels, Frank W.; Kern, Florian; Fuchs, Gerhard; Hinderer, Nele; Kungl, Gregor; Mylan, Josephine; Neukirch, Mario; Wassermann, Sandra	Research Policy	The enactment of socio-technical transition pathways, A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014)	2016	Germany, UK	1	Transition Studies	Transition pathways typology Enactment Low-carbon electricity transition Multi-level persp...
91	Genus, Audley; Theobald, Kate	European Urban and Regional Studies	Creating low-carbon neighbourhoods, a critical discourse analysis	2016	UK	9	Norms& Values	Critical discourse analysis, engagement, low-carbon neighbourhoods, sustainable communities...
92	Giddings, Bob; Underwood, Chris	Journal of Environmental Planning and Management	Renewable energy in remote communities	2007	UK	7	Energy planning	none
93	Goedkoop, Fleur; Devine-Wright, Patrick	Energy Research & Social Science	Partnership or placation, The role of trust and justice in the shared ownership of renewable energy projects	2016	UK	9	Norms& Values	Shared ownership Renewable energy Community energy Trust Justice

94	Gormally, AM; Pooley, CG; Whyatt, JD; Timmis, RJ	Local Environment	"They made gunpowder, yes down by the river there, that's your energy source": attitudes towards community renewable energy in Cumbria	2014	UK	5	Sociology	community renewable energy; place-based identity; historical hydropower; community participation
95	Gormally, A.M.; Whyatt, J.D.; Timmis, R.J.; Pooley, C.G.	Applied Geography	Renewable energy scenarios, Exploring technology, acceptance and climate, Options at the community-scale	2016	UK	7	Energy planning	Energy scenarios Energy & environment Community-based renewables Climate
96	Graichen, P. R.; Requate, T.; Dijkstra, B. R.	Public Choice	How to win the political contest: A monopolist vs. environmentalists	2001	Germany	3	Economics	none
97	Granberg, Mikael; Elander, Ingemar	Local Environment	Local governance and climate change: reflections on the Swedish experience	2007	Sweden	6	Governance	none
98	Graziano, A.M.; Whyatt, J.D.; Timmis, R.J.; Pooley, C.G.	Energy Research & Social Science	A transformational paradigm for marine renewable energy development	2016	UK	6	Governance	Community Development paradigm Economic development Marine renewables
99	Groth Niels Boje; Fertner, Christian; Grosse, Juliane	Journal of Settlements and Spatial Planning	Urban energy generation and the role of cities	2016	multiple	7	Energy planning	local energy, energy self-sufficiency, medium-sized cities, sustainable development...
100	Grydehøj Adam; Kelman, Ilan	Area	The eco-island trap, climate change mitigation and conspicuous sustainability	2017	multiple	9	Norms& Values	islands, climate change mitigation, conspicuous sustainability, renewable energy, sustain...
101	Gustafsson, S.; Ivner, J.; Palm, J.	Journal of Cleaner Production	Management and stakeholder participation in local strategic energy planning - Examples from Sweden	2015	Sweden	7	Energy planning	energy strategy; management; municipality; participation; planning
102	Haf, Sioned; Parkhill, Karen	Energy Research & Social Science	The Muillean Gaoithe and the Melin Wynt, Cultural sustainability and community owned wind energy schemes in Gaelic and Welsh speaking communities in the United Kingdom	2017	UK	5	Sociology	Community renewables Cultural sustainability Language Heritage Wales Scotland
103	Hall, Nina L.; Taplin, Ros; Goldstein, Wendy	Action research	Empowerment of individuals and realization of community agency Applying action research to climate change responses in Australia	2010	Australia	6	Governance	agency; Australia; climate change; grassroots; Participatory Action Research (PAR)
104	Hall, Stephen; Foxon, Timothy J.; Bolton, Ronan	Energy Research & Social Science	Financing the civic energy sector, How financial institutions affect ownership models in Germany and the United Kingdom	2016	Germany, UK	3	Economics	Civic energy sector Institutional economics Energy transitions Energy ownership

105	Hanley, Nick; Nevin, Ceara	Energy Policy	Appraising renewable energy developments in remote communities: the case of the North Assynt Estate, Scotland	1999	Sweden, UK	3	Economics	renewable energy; impact analysis; contingent valuation
106	Hargreaves, Tom; Hielscher, Sabine; Seyfang, Gill; Smith, Adrian	Global Environmental Change	Grassroots innovations in community energy: The role of intermediaries in niche development	2013	UK	1	Transition Studies	Strategic niche management; intermediary actors; grassroots innovation; community energy
107	Hargreaves, Tom; Longhurst, Noel; Seyfang, Gill	Environment and Planning A	Up, down, round and round: connecting regimes and practices in innovation for sustainability	2013	none	1	Transition Studies	sustainability transitions, sustainable innovation, local organic food, pro-environmental behaviour, multilevel perspective, social practice theory
108	Hasanov, Mustafa; Zuidema, Christian	Energy Research & Social Science	The transformative power of self-organization, Towards a conceptual framework for understanding local energy initiatives in The Netherlands	2018	Netherlands	5	Sociology	Self-organization Local energy initiatives The Netherlands Energy transition Transformativ...
109	Hatzl, Stefanie; Seebauer, Sebastian; Fleiß, Eva; Posch, Alfred	Futures	Market-based vs. grassroots citizen participation initiatives in photovoltaics, A qualitative comparison of niche development	2016	Austria	1	Transition Studies	Citizen participation initiatives Photovoltaics Grassroots innovations Market-based innova...
110	Hauber, J.; Ruppert-Winkel, C.	Sustainability	Moving towards energy self-sufficiency based on renewables: Comparative case studies on the emergence of regional processes of socio-technical change in germany	2012	Germany	2	Science& Techn	energy system based on renewable energy; phase model; processual analysis; renewable energy; socio-technical change
111	Hawkey, David; Webb, Janette; Winskel, Mark	Journal of Cleaner Production	Organisation and governance of urban energy systems: district heating and cooling in the UK	2013	UK	7	Energy planning	sustainable energy; urban; district heating and cooling; governance; organization
112	Hawkins, Christopher V.; Wang, XiaoHu	Public Works Management & Policy	Sustainable development governance: Citizen participation and support networks in local sustainability initiatives	2011	USA	6	Governance	citizen participation–public works, environmental planning
113	Heiman, Michael K.; Solomon, Barry D.	Annals of the Association of American Geographers	Power to the people: Electric utility restructuring and the commitment to renewable energy	2004	USA	3	Economics	carbon dioxide (CO2) emissions, electric utility, energy policy, renewable energy, wind power
114	Heiskanen, E.; Jalas, M.; Rinkinen, J.; Tainio, P.	Environmental Innovation and Societal Transitions	The local community as a "low-carbon lab": Promises and perils	2015	Finland	5	Sociology	community; local experiments; Strategic niche management

115	Heiskanen, Eva; Johnson, Mikael; Robinson, Simon; Vadovics, Edina; Saastamoinen, Mika	Energy Policy	Low-carbon communities as a context for individual behavioural change	2010	Finland, Hungary, UK	1	Transition Studies	low-carbon communities; energy conservation; behaviour change
116	Heiskanen, Eva; Lovio, Raimo; Jalas, Mikko	Journal of Cleaner Production	Path creation for sustainable consumption: promoting alternative heating systems in Finland	2011	Finland	1	Transition Studies	path dependence; path creation; residential energy efficiency; heat pumps; entrepreneurs
117	Heldeweg, M. A.; Sanders, M.; Harmsen, M.	Energy, Sustainability and Society	Public-private or private-private energy partnerships? Toward good energy governance in regional and local green gas projects	2015	Netherlands	6	Governance	Public-private partnerships (PPP); energy transition and green gas
118	Heldeweg, Michiel A.	Sustainability	Normative Alignment, Institutional Resilience and Shifts in Legal Governance of the Energy Transition	2017	Netherlands	9	Norms& Values	renewable energy; legal governance; normative alignment; institutional resilience; legal i...
119	Hicks, Jarra; Ison, Nicola	Energy Policy	An exploration of the boundaries of 'community' in community renewable energy projects, Navigating between motivations and context	2018	Australia, Austria, Canada, Denmark, Germany, USA	9	Norms& Values	Community renewable energy Action research
120	Hicks, Jarra; Ison, Nicky	Rural Society	Community-owned renewable energy (CRE): Opportunities for rural Australia	2011	Australia, UK, USA	5	Sociology	community development, community renewable energy, climate change, resilience
121	Hinshelwood, Emily	Community Development Journal	Power to the People: community-led wind energy, obstacles and opportunities in a South Wales Valley	2001	UK	5	Sociology	none
122	Hobson, Kersty; Hamilton, Jo; Mayne, Ruth	Environment & Planning A	Monitoring and evaluating eco-localisation, Lessons from UK low carbon community groups	2016	UK	5	Sociology	Localisation, knowledge exchange, monitoring and evaluation, community
123	Hobson, Kersty; Mayne, Ruth; Hamilton, Jo	Local Environment	Monitoring and evaluation in UK low carbon community groups benefits barriers and the politics of the local	2016	UK	5	Sociology	low-carbon community groups; monitoring and evaluation
124	Hoffman, S. M.; Fudge, S.; Pawlisch, L.; High-Pippert, A.; Peters, M.; Haskard, J.	Sustainability (Switzerland)	Public values and community energy: Lessons from the US and UK	2013	USA, UK	5	Sociology	community energy; local energy governance; public sphere; public values

<b>125</b>	Hoffman, S. M.; High-Pippert, A.	Bulletin of Science, Technology and Society	Community energy: A social architecture for an alternative energy future	2005	USA	6	Governance	civic culture; community energy; community participation; distributed generation; energy
<b>126</b>	Hoffman, Steven M.; High-Pippert, Angela	Energy Policy	From private lives to collective action: Recruitment and participation incentives for a community energy program	2010	USA	9	Norms& Values	civic engagement; participation; recruitment
<b>127</b>	Homsy, George C.	Environment and Planing C: government and policy	Powering sustainability, Municipal utilities and local government policymaking	2016	USA	6	Governance	Local government, municipal utilities, energy policy, electricity
<b>128</b>	Hooimeijer F.L.; Puts, H.; Geerdink, T.	Journal of Settlements and Spatial Planning	Successful Development of Decentralised District Heating Application of a Theoretical Framework	2016	Netherlands	7	Energy planning	energy planning, district heating, decentralized energy, spatial arrangements, orga...
<b>129</b>	Hoppe, T.; Graf, A.; Warbroek, B.; Lammers,I.; Lepping,I.	Sustainability (Switzerland)	Local governments supporting local energy initiatives: Lessons from the best practices of Saerbeck (Germany) and Lochem (The Netherlands)	2015	Germany, Netherlands	1	Transition Studies	civil society; energy transition; governance; grassroots innovation; leadership; local capacity; local energy initiatives; low carbon; strategic niche management
<b>130</b>	Hoppe, Thomas; van der Vegt, Arjen; Stegmaier, Peter	Sustainability	Presenting a Framework to Analyze Local Climate policy and action in small and medium-sized cities	2016	Netherlands	6	Governance	small and medium-sized cities; climate governance; energy transition; climate change mitig...
<b>131</b>	Hufen, J. A. M.; Koppenjan, J. F. M.	Energy, Sustainability and Society	Local renewable energy cooperatives: revolution in disguise?	2015	Netherlands	1	Transition Studies	Bottom-up innovation;Energy innovation systems;Energy transition;Local renewable energy;Local renewable energy cooperatives;Radical innovation
<b>132</b>	Hughes, Kristen	Bulletin of Science, Technology & Society	An Applied Local Sustainable Energy Model: The Case of Austin, Texas	2009	USA	7	Energy planning	sustainable development; sustainable urban development; environmental engineering; climatic changes; renewable energy sources; economics; sociological aspects; energy economics; alternative fuels; energy conservation; AUSTIN (Tex.); Texas; communities; distributed generation; electricity; municipal utility;renewable energy;sustainable energy
<b>133</b>	Islar, Mine; Busch, Henner	Innovation, the European Journal of Social Science Research	We are not in this to save the polar bears the link between community renewable	2016	Denmark, Germany	9	Norms& Values	ecological citizenship; energy commons; local renewable energy; communal energy; energy tr...



			energy development and ecological citizenship					
<b>134</b>	Ivner, J.	Local Environment	Energy planning with decision-making tools: Experiences from an energy-planning project	2009	Sweden	7	Energy planning	energy planning; LCA; local authority; participation; scenarios
<b>135</b>	Ivner, J.; Björklund, A.E.; Dreborg, K.-H.; Johansson, J.; Viklund, P.; Wiklund, H.	Local Environment	New tools in local energy planning: Experimenting with scenarios, public participation and environmental assessment	2010	Sweden	7	Energy planning	decision-making tools; energy planning; life cycle assessment; local authority; public participation; scenarios
<b>136</b>	Jaccard, Mark; Failing, Lee; Berry, Trent	Energy Policy	From equipment to infrastructure: community energy management and greenhouse gas emission reduction	1997	Canada	7	Energy planning	none
<b>137</b>	Kalkbrenner, Bernhard J.; Roosen, Jutta	Energy Research & Social Science	Citizens' willingness to participate in local renewable energy projects, The role of community and trust in Germany	2016	Germany	9	Norms& Values	Citizen participation Community energy Community identity Energy transition Pro-environmen...
<b>138</b>	Klein, Sharon J.W.; Coffey, Stephanie	Renewable & Sustainable Energy Reviews	Building a sustainable energy future, one community at a time	2016	USA	3	Economics	Community energy Renewable energy Sustainable energy Grassroots innovation Strategic niche managemen...
<b>139</b>	Koehrsen, Jens	Sustainability	Boundary Bridging Arrangements, A Boundary Work Approach to Local Energy Transitions	2017	Germany	2	Science& Techn	boundary work; energy transition; cities; collaboration; boundary objects; boundary organi...
<b>140</b>	Koehrsen, J.	Social Compass	Does religion promote environmental sustainability? Exploring the role of religion in local energy transitions	2015	Germany	1	Transition Studies	climate change; ecology; Germany; regional innovation systems; religion
<b>141</b>	Koirala, Binod Prasad; Koliou, Elta; Friege, Jonas; Hakvoort, Rudi A.; Herder, Paulien M.	Renewable & Sustainable Energy Reviews	Energetic communities for community energy, A review of key issues and trends shaping integrated community energy systems	2016	multiple	7	Energy planning	Distributed energy resources Local energy systems Energy systems integration Self-organize...
<b>142</b>	Komendantova, Nadejda; Riegler, Monika; Neumueller, Sonata	Energy Research & Social Science	Of transitions and models, Community engagement, democracy, and empowerment in the Austrian energy transition	2018	Austria	5	Sociology	Climate and energy model regions Renewable energy sources Energy and climate policy in Aus...
<b>143</b>	Kooij, Henk Jan; Oteman, Marieke; Veenman, Sietske; Sperling, Karl; Magnusson,	Energy Research & Social Science	Between grassroots and treetops, Community power and institutional dependence in the renewable energy	2018	Denmark, Netherlands, Sweden	6	Governance	Grassroots initiatives Renewable energy transition Institutional change Conditions of poss...

	Dick; Palm, Jenny; Hvelplund, Frede		sector in Denmark, Sweden and the Netherlands					
144	Kruijsen, J.H J.; Owen, A.; Boyd, D.M.G.	Local Environment	Community Sustainability Plans to enable change towards sustainable practice - a Scottish case study	2014	UK	7	Energy planning	sustainable development; resilient community development; Community Sustainability Plan; behavioural change; Huntly UK
145	Krupa, J.; Galbraith, L.; Burch, S.	Local Environment	Participatory and multi-level governance: applications to Aboriginal renewable energy projects	2015	Canada	7	Energy planning	Aboriginal peoples; Canadian energy markets; community energy planning; renewable energy
146	Kunze, Conrad; Becker, Sören	Sustainability Science	Collective ownership in renewable energy and opportunities for sustainable degrowth	2015	Germany, Italy, Spain, UK	5	Sociology	community energy; remunicipalisation; energy cooperatives; energy geography; degrowth; renewable energy; energy transition
147	Kunze, Conrad; Busch, Henner	Electronic Green Journal	The social complexity of renewable energy production in the countryside	2011	Germany	3	Economics	renewable energy; energy autarky, energy region, rural development, Germany, Europe, social research
148	Leenheer, Jorna; de Nooij, Michiel; Sheikh, Omer	Energy Policy	Own power: Motives of having electricity without the energy company	2011	Netherlands	9	Norms& Values	own power; electricity; sustainability
149	Lucas, Karen; Hamilton, Jo; Mayne, Ruth	Local Environment	Building capacity through action research reflections on working with low carbon communities in the UK	2017	UK	5	Sociology	Energy behaviours; communities; action research; methodologies; focus groups; social learni...
150	MacArthur, Julie L.	Journal of Environmental Studies & Sciences	Challenging public engagement, participation, deliberation and power in renewable energy policy	2016	Canada, Denmark	6	Governance	Renewable energy . Participation . Public engagement . Policy
151	MacArthur, Julie L.	Sustainability	Trade, Tarsands and Treaties, The Political Economy Context of Community Energy in Canada	2017	Canada	6	Governance	community energy; energy policy; Canada; political economy; renewable electricity; public...
152	Madlener, Reinhard	Energy Policy	Innovation diffusion, public policy, and local initiative: The case of wood-fuelled district heating systems in Austria	2007	Austria	7	Energy planning	socio-economic aspects; local actors; biomass district heating
153	Magnani, Natalia; Maretti, Mara; Salvatore, Rita; Scotti, Ivano	Energy Research & Social Science	Does civil society matter, Challenges and strategies of grassroots initiatives in Italy's energy transition	2016	Italy	5	Sociology	Energy cooperatives Civil society Community renewable energy Energy transition Italy

154	Magnani, Natalia; Osti, Giorgio	Journal of Rural Studies	Ecopreneurs, rural development and alternative socio-technical arrangements for community renewable energy	2017	Italy	3	Economics	None
155	Malgand, M.; Bay-Mortensen, N.; Bedkowska, B.; Hansen, F.N.; Schow, M.; Thomsen, A.A.; Hunka, A.D.	Geoforum	Environmental awareness, the Transition Movement, and place: Den Selvforsynende Landsby, a Danish Transition initiative	2014	Denmark	9	Norms& Values	constructed landscape; place attachment; transition network; climate change; environmental awareness; peak oil
156	Markantoni, Marianna	Environmental Policy and Governance	Low Carbon Governance, Mobilizing Community Energy through Top-Down Support	2016	UK	6	Governance	community renewable energy; evolutionary governance; multi-level governance
157	Markantoni, M.; Woolvin, M.	Local Environment	The role of rural communities in the transition to a low-carbon Scotland: A review	2015	UK	6	Governance	rural communities; low-carbon; transition; rural Scotland
158	Mårtensson, Kjell; Westerberg, Karin	Energy Policy	How to transform local energy systems towards bioenergy? Three strategy models for transformation	2007	Sweden	6	Governance	local energy system; renewable energy; strategy models
159	Martiskainen, Mari	Environmental Innovation and Societal Transitions	The role of community leadership in the development of grassroots innovations	2016	UK	1	Transition Studies	Community leadership Grassroots innovations Nurturing Intermediaries Community energy
160	Martiskainen, Mari; Heiskanen, Eva; Speciale, Giovanna	Local Environment	Community energy initiatives to alleviate fuel poverty the material politics of Energy Cafes	2018	UK	1	Transition Studies	Grassroots innovations; material politics; community energy; fuel poverty; Energy Café
161	Mey, Franziska; Diesendorf, Mark; MacGill, Iain	Energy Research & Social Science	Can local government play a greater role for community renewable energy, A case study from Australia	2016	Australia	6	Governance	Local government Renewable energy Community renewable energy
162	Middlemiss, Lucie; Parrish, Bradley D.	Energy Policy	Building capacity for low-carbon communities: The role of grassroots initiatives	2010	UK	5	Sociology	low-carbon communities; grassroots action; sustainable communities
163	Moloney, S.; Horne, R.	Sustainability (Switzerland)	Low carbon urban transitioning: From local experimentation to urban transformation?	2015	Australia	5	Sociology	socio-technical transitions; low carbon governance; urban policy
164	Moloney, Susie; Horne, Ralph E.; Fien, John	Energy Policy	Transitioning to low carbon communities, from behaviour change to systemic change: Lessons from Australia	2010	Australia	1	Transition Studies	behaviour change; socio-technical analysis; behaviour change programmes

165	Monstadt, J.	International Journal of Urban and Regional Research	Urban governance and the transition of energy systems: Institutional change and shifting energy and climate policies in Berlin	2007	Germany	6	Governance	none
166	Morris, Jason	Culture, Agriculture, Food and Environment	The Evolving Localism (and Neoliberalism) of Urban Renewable Energy Projects	2013	USA	3	Economics	renewable energy, neoliberalization, localism, political economy, United States
167	Moss, T.; Becker, S.; Naumann, M.	Local Environment	Whose energy transition is it, anyway? Organisation and ownership of the Energiewende in villages, cities and regions	2015	Germany	5	Sociology	Berlin; Brandenburg; commons; Germany; local energy transitions; organisation; ownership
168	Müller, Matthias Otto; Stämpfli, Adrian; Dold, Ursula; Hammer, Thomas	Energy Policy	Energy autarky: A conceptual framework for sustainable regional development	2011	Austria, Germany, Switzerland	7	Energy planning	energy autarky; renewable energy; regional development
169	Musall, Fabian David; Kuik, Onno	Energy Policy	Local acceptance of renewable energy, A case study from southeast Germany	2011	Germany	4	Acceptance	wind energy; local acceptance; community co-ownership
170	Nijkamp, Peter; Pepping, Gerard	Urban Studies	A meta-analytical evaluation of sustainable city initiatives	1998	Greece, Italy, Netherlands	6	Governance	none
171	Nilsson, J. Stenlund; Mårtensson, A.	Applied Energy	Municipal energy-planning and development of local energy-systems	2003	Sweden	7	Energy planning	energy-planning; national energy; municipal energy; environmental impact; strategies
172	Nolden, Colin	Energy Policy	Governing community energy—Feed-in tariffs and the development of community wind energy schemes in the United Kingdom and Germany	2013	UK	6	Governance	Governance of innovation diffusion Feed-in tariff Community energy
173	North, Peter	Environment and Planning- Part A	The politics of climate activism in the UK: a social movement analysis	2011	UK	5	Sociology	none
174	Ornetzeder, Michael; Rohrer, Harald	Energy Policy	User-led innovations and participation processes: lessons from sustainable energy technologies	2006	Austria	1	Transition Studies	user-led innovations; sustainable energy technology; constructive technology assessment
175	Ornetzeder, M.; Rohrer, H.	Global Environmental Change	Of solar collectors, wind power, and car sharing: Comparing and understanding	2013	Austria, Denmark	2	Science& Techn	sustainability; grassroots innovation; energy; transport; socio-technical systems; civil society

			successful cases of grassroots innovations					
176	Oteman, M.; Wiering, M.; Helderma, J.-K	Energy, Sustainability and Society	The institutional space of community initiatives for renewable energy: a comparative case study of the Netherlands, Germany and Denmark	2014	Denmark, Germany, Netherlands	6	Governance	community initiatives; institutional arrangements; institutional space; policy analysis; renewable energy
177	Palm, J.	Local Environment	Development of sustainable energy systems in Swedish municipalities: A matter of path dependency and power relations	2006	Sweden	2	Science& Techn	none
178	Palm, Jenny; Falde, Magdalena	Sustainability	What Characterizes a System Builder, The Role of Local Energy Companies in Energy System Transformation	2016	Sweden	2	Science& Techn	system builder; energy system; municipality; energy company; policy processes
179	Parag,Yael; Janda, Kathryn B.	Energy Research & Social Science	More than filler: Middle actors and socio-technical change in the energy system from the 'middle-out'	2014	UK	5	Sociology	energy system transition; middle-out; agency and capacity; middle actors
180	Park, J. J.	Local Environment	Fostering community energy and equal opportunities between communities	2012	UK	9	Norms& Values	community capacity;community development;energy policy;equity;renewable energy;sustainable energy
181	Parkhill, Karen Anne; Shirani, Fiona; Butler, Catherine; Henwood, KL; Groves, Chris; Pidgeon, Nick F.	Environmental Science & Policy	We are a community [but] that takes a certain amount of energy': Exploring shared visions, social action, and resilience in place-based community-led energy initiatives	2015	UK	5	Sociology	community energy; sustainable places; social capital; civic engagement; social resilience
182	Petersen, Jens Phillip	Sustainable Cities and Society	Energy concepts for self-supplying communities based on local and renewable energy sources, A case study from northern Germany	2016	Germany	7	Energy planning	Energy concept Community energy planning Energy-self-sufficient community Renewable energi...
183	Petrakopoulou, Fontina	Sustainability	The Social Perspective on the Renewable Energy Autonomy of Geographically Isolated Communities, Evidence from a Mediterranean Island	2017	Greece	4	Acceptance	green energy autonomy; renewable energy; survey; island; Greece
184	Phillips, M.; Dickie, J.	Geoforum	Climate change, carbon dependency and narratives of transition and stasis in four English rural communities	2015	UK	9	Norms& Values	climate change; carbon; rural; transition; stasis; narrative

185	Pitt Damian; Congreve, Alina	Local Environment	Collaborative approaches to local climate change and clean energy initiatives in the USA and England	2017	UK, USA	7	Energy planning	Energy; climate mitigation; community planning; collaborative planning
186	Pitt, Damian; Bassett, Ellen	Journal of the American Planning Association	Collaborative planning for clean energy initiatives in small to mid-sized cities	2013	USA	6	Governance	clean energy, energy policy, climate change, collaborative planning
187	Poupeau, Francois-Mathieu	Environmental Policy and Governance	Central-Local Relations in French Energy Policy-Making: Towards a New Pattern of Territorial Governance	2014	France	6	Governance	central–local relations; decentralization; energy transition; local authorities; territorial governance
188	Raven, R. P.; Heiskanen, E.; Lovio, R.; Hodson, M.; Brohmman, B.	Bulletin of Science, Technology & Society	The contribution of local experiments and negotiation processes to field-level learning in emerging (niche) technologies meta-analysis of 27 new energy projects in europe.	2008	Germany, Sweden	1	Transition Studies	strategic niche management; learning; expectations; biogas
189	Raven, R.P.J.M.; Mourik, R.M.; Feenstra, C.F.J.; Heiskanen, E.	Energy	Modulating societal acceptance in new energy projects: Towards a toolkit methodology for project managers	2009	multiple	4	Acceptance	social acceptance; new energy projects; participation
190	Reiche, Danyel; Bechberger, Mischa	Energy Policy	Policy differences in the promotion of renewable energies in the EU member states	2004	Multiple	6	Governance	project management
191	Reusswig, Fritz; Braun, Florian; Heger, Ines; Ludewig, Thomas; Eichenauer, Eva; Lass, Wiebke	Utilities Policy	Against the wind, Local opposition to the German Energiewende	2016	Germany	4	Acceptance	Energy conflicts Acceptance of wind energy Discourse networks Conflict dynamics
192	Rezaei, Maryam; Dowlatabadi, Hadi	Local Environment	Off grid community energy and the pursuit of self sufficiency in British Columbia s remote and First Nations communities	2016	Canada	9	Norms& Values	community energy; remote communities; self-sufficiency; self- determination
193	Rogers, Jennifer C.; Simmons, Eunice A.; Convery, Ian; Weatherall, Andrew	Energy Policy	Public perceptions of opportunities for community-based renewable energy projects	2008	UK	5	Sociology	renewable energy; community; participation
194	Rogers, Jennifer C.; Simmons, Eunice A.; Convery, Ian; Weatherall, Andrew	Local Economy	What factors enable community leadership of renewable energy projects? Lessons from a woodfuel heating initiative	2012	UK	5	Sociology	community, participation, place-based identity, renewable energy, rural sustainability

<b>195</b>	Rommel, Jens; Radtke, Jorg; von Jorck, Gerrit; Mey, Franziska; Yildiz, Özgür	Journal of Cleaner Production	Community renewable energy at a crossroads, A think piece on degrowth, technology, and the democratization of the German energy system	2016	Germany	3	Economics	Cooperatives Energy transition Conviviality Sustainable consumption
<b>196</b>	Roseland, Mark	Progress in Planning	Sustainable community development: integrating environmental, economic, and social objectives	2000	none	8	Spatial design	none
<b>197</b>	Ruggiero, Salvatore; Onkila, Tiina; Kuittinen, Ville	Energy Research & Social Science	Realizing the social acceptance of community renewable energy: A process-outcome analysis of stakeholder influence	2014	multiple	5	Sociology	community renewable energy; stakeholder influence; process and outcome
<b>198</b>	Rydin, Y.; Guy, S.; Goodier, C.; Chmutina, K.; Devine-Wright, P.; Wiersma, B.	Geoforum	The financial entanglements of local energy projects	2015	Germany, Sweden, UK, USA	3	Economics	decentralised energy; economic sociology; energy efficiency; green buildings; market devices
<b>199</b>	Sagebiel, J.; Müller, J. R.; Rommel, J.	Energy Research & Social Science	Are consumers willing to pay more for electricity from cooperatives? results from an online choice experiment in germany	2014	Germany	3	Economics	choice experiments; cooperatives; energy transition
<b>200</b>	Saintier, Séverine	Sustainability	Community Energy Companies in the UK, A Potential Model for Sustainable Development in “Local” Energy	2017	UK	9	Norms& Values	energy transition; renewable energy sources; energy poverty; community interest companies;...
<b>201</b>	Sanders, M.P.T.; Heldeweg, M.A.; Straatman, E.G.P.; Wempe, J.F.D.B.	Energy, Sustainability and Society	Energy policy by beauty contests: The legitimacy of interactive sustainability policies at regional levels of the regulatory state	2014	Netherlands	6	Governance	energy transition; interactive governance; legitimacy; regulatory state
<b>202</b>	Schmidt, Johannes; Schönhart, Martin; Biberacher, Markus; Guggenberger, Thomas; Hausl, Stephan; Kalt, Gerald; Leduc, Sylvain; Schardinger, Ingrid; Schmid, Ervin	Energy Policy	Regional energy autarky: Potentials, costs and consequences for an Austrian region	2012	Austria	7	Energy planning	regional energy modeling; energy autarky; BeWhere
<b>203</b>	Schoor van der, Tineke; Scholtens, Bert	Renewable and Sustainable Energy Reviews	Power to the people: Local community initiatives and the transition to sustainable energy	2015	Netherlands	2	Science& Techn	decentralized energy production; energy initiatives; citizen groups; energy neutrality; sustainable energy; prosumers

<b>204</b>	Schreuer, Anna	Energy Research & Social Science	The establishment of citizen power plants in Austria, A process of empowerment	2016	Austria	5	Sociology	Citizen power plants Community energy Empowerment Sociotechnical configurations Grassroots...
<b>205</b>	Schweizer-Ries, Petra	Energy Policy	Energy sustainable communities: Environmental psychological investigations	2008	Germany	4	Acceptance	sustainable energy communities; public acceptance; environmental psychology
<b>206</b>	Scotti, Ivano; Minervini, Dario	Innovation, the European Journal of Social Science Research	Performative connections translating sustainable energy transition by local communities	2017	Italy	2	Science& Techn	local community; translation; sustainable energy transition
<b>207</b>	Seyfang, Gill; Haxeltine, Alex	Environment and Planning- Part C	Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions	2012	UK	1	Transition Studies	sustainability transitions, grassroots innovations, community energy, civil society, social innovation, ni
<b>208</b>	Seyfang, Gill; Hielscher, Sabine; Hargreaves, Tom; Martiskainen, Mari; Smith, Adrian	Environmental Innovation and Societal Transitions	A grassroots sustainable energy niche? Reflections on community energy in the UK	2014	UK	5	Sociology	civil society; energy transitions; grassroots innovations; Strategic Niche Management; sustainable innovations
<b>209</b>	Seyfang, Gill; Park, Jung Jin; Smith, Adrian	Energy Policy	A thousand flowers blooming? An examination of community energy in the UK	2013	UK	1	Transition Studies	sustainable energy;Grassroots innovations;Civil society
<b>210</b>	Seyfang, Gill; Smith, Adrian	Environmental politics	Grassroots innovations for sustainable development: Towards a new research and policy agenda	2007	UK	1	Transition Studies	none
<b>211</b>	Shamsuzzoha, AHM; Grant, Andy; Clarke, Joe	Renewable and Sustainable Energy Reviews	Implementation of renewable energy in Scottish rural area: A social study	2012	UK	4	Acceptance	renewable energy; social study; environmental awareness; Scotland
<b>212</b>	Sharp, Darren; Salter, Robert	Sustainability	Direct Impacts of an Urban Living Lab from the Participants' Perspective, Livewell Yarra	2017	Australia	1	Transition Studies	urban sustainability; urban living lab; sustainability transitions; urban experiments; act...
<b>213</b>	Shaw, K.; Hill, S. D.; Boyd, A.D.; Monk, L.; Reid, J.; Einsiedel, E.F.	Energy Research and Social Science	Conflicted or constructive? Exploring community responses to new energy developments in Canada	2015	Canada	4	Acceptance	climate change; community; low-carbon energy systems; resistance; governance; local context
<b>214</b>	Shih, Cheng Hao; Latham, William; Sarzynski, Andrea	The Electricity Journal	A collaborative framework for U.S. state-level energy efficiency and renewable energy governance	2016	USA	6	Governance	State energy efficiency and renewable energy program Energy governance Program administrat...



<b>215</b>	Simcock, Neil	Local Environment	Exploring how stakeholders in two community wind projects use a 'those affected' principle to evaluate the fairness of each project's spatial boundary	2014	UK	9	Norms& Values	community; wind; justice; renewable energy; local
<b>216</b>	Simcock, Neil	Land Use Policy	Procedural justice and the implementation of community wind energy projects, A case study from South Yorkshire, UK	2016	UK	9	Norms& Values	Community energy Wind energy Justice Fairness Conflict Acceptance
<b>217</b>	Simpson, Genevieve	Local Environment	Looking beyond incentives the role of champions in the social acceptance of residential solar energy in regional Australian communities	2017	Australia	4	Acceptance	Renewable energy; solar champion; residential solar; diffusion of innovation; social accept...
<b>218</b>	Slee, Bill	Renewable and Sustainable Energy Reviews	Is there a case for community-based equity participation in Scottish on-shore wind energy production? Gaps in evidence and research needs	2015	UK	6	Governance	rural; community; renewable; ownership; targets; environmental citizenship; equity participation
<b>219</b>	Smith, Adrian; Hargreaves, Tom; Hielscher, Sabine; Martiskainen, Mari; Seyfang, Gill	Environment & Planning A	Making the most of community energies, Three perspectives on grassroots innovation	2016	UK	1	Transition Studies	Grassroots innovation, community energy, strategic niche management, critical niches, energ...
<b>220</b>	Smith, Adrian; Raven, Rob	Research Policy	What is protective space? Reconsidering niches in transitions to sustainability	2012	none	1	Transition Studies	niche; protective space; empowerment; narratives; sustainability
<b>221</b>	Späth, P.; Rohrer, H.	European Planning Studies	Local Demonstrations for Global Transitions-Dynamics across Governance Levels Fostering Socio-Technical Regime Change Towards Sustainability	2012	Austria	1	Transition Studies	none
<b>222</b>	Sperling, Karl	Renewable & Sustainable Energy Reviews	How does a pioneer community energy project succeed in practice, The case of the Samsø Renewable Energy Island	2017	Denmark	5	Sociology	Community energy Renewable energy Islands Energy planning
<b>223</b>	Sperling, Karl; Hvelplund, Frede; Mathiesen, Brian Vad	Energy Policy	Centralisation and decentralisation in strategic municipal energy planning in Denmark	2011	Denmark	7	Energy planning	strategic energy planning; municipal energy plans; 100% renewable energy systems
<b>224</b>	St. Denis, Genevieve; Parker, Paul	Renewable and Sustainable Energy Reviews	Community energy planning in Canada: The role of renewable energy	2009	Canada	7	Energy planning	renewable energy policy; community energy plan; community energy

								management; energy conservation; climate change policy
<b>225</b>	Steenhuisen, B.; de Bruijne, M.	Energy, Sustainability and Society	Reflections on the role of energy network companies in the energy transition	2015	Netherlands	3	Economics	economics; energy network companies; energy transition; engineering; law; policy; politics
<b>226</b>	Strachan, Peter A.; Cowell, Richard; Ellis, Geraint; Sherry-Brennan, Fionnguala; Toke, David	Sustainable Development	Promoting community renewable energy in a corporate energy world	2015	UK	1	Transition Studies	sustainable development; renewable energy; community energy; United Kingdom; devolution; energy transition
<b>227</b>	Strunz, Sebastian	Ecological Economics	The German energy transition as a regime shift	2014	Germany	2	Science& Techn	energy system; energy transition; regime shift; renewable energy sources; resilience
<b>228</b>	Sühlsen, Kathrin; Hisschemöller, Matthijs	Energy Policy	Lobbying the Energiewende. Assessing the effectiveness of strategies to promote the renewable energy business in Germany	2014	Germany	6	Governance	energy transition; lobbying; renewable energy; repertory grid; Germany
<b>229</b>	Süsser, Diana; Kannen, Andreas	Journal Sustain Sci	Renewables, Yes, please', perceptions and assessment of community transition induced by renewable-energy projects in North Frisia	2017	Germany	5	Sociology	Community renewable energy Renewable energy Energy transition Community benefits
<b>230</b>	Thorp, John P.; Curran, Lara	Bulletin of Science, Technology & Society	Affordable and Sustainable Energy in the Borough of Woking in the United Kingdom	2009	UK	7	Energy planning	sustainable development; environmental engineering; environmental policy; environmental protection; sustainable urban development; boroughs; cities & towns; local government; electric power distribution; Great Britain; climate change; cogeneration; environment; ESCO; local policy; partnership; reinvestment; sustainability
<b>231</b>	Tomc, Elizabeth; Vassallo, Anthony M	International Journal of Sustainable Energy Planning and Management	The effect of individual and communal electricity generation, consumption and storage on urban Community Renewable Energy Networks (CREN), an Australian case study	2016	Australia	7	Energy planning	Community renewable energy network, community energy, off-grid, community consumption, community gen...
<b>232</b>	Tonn, B.; Stiefel, D.	Futures	Willow pond: A decentralized low-carbon future scenario	2014	USA	5	Sociology	self-sufficiency; decentralized governance; home energy system; local manufacturing system; immersive telecommunications; sprawl farm

<b>233</b>	Tozer, Laura	Local Environment	Community energy plans in Canadian cities: success and barriers in implementation	2013	Canada	7	Energy planning	community energy planning; energy management; municipalities; cities; local climate change action plan
<b>234</b>	Trutnevyte, E.; Stauffacher, M.	Environmental Development	Opening up to a critical review of ambitious energy goals: Perspectives of academics and practitioners in a rural Swiss community	2012	Switzerland	7	Energy planning	radical energy system change; rural community; transdisciplinary case study
<b>235</b>	Van der Schoor, Tineke; Van Lente, Harro; Scholtens, Bert; Peine, Alexander	Energy Research & Social Science	Challenging obduracy, How local communities transform the energy system	2016	Netherlands	5	Sociology	Community energy Cooperatives Renewable energy Energy transition
<b>236</b>	van Rooijen, Sascha N. M.; van Wees, Mark T.	Energy Policy	Green electricity policies in the Netherlands: an analysis of policy decisions	2006	Netherlands	6	Governance	green electricity; renewable energy; the Netherlands
<b>237</b>	Van Veelen, Bregje	Sociologia Ruralis	Uncommon Ground, The Role of Different Place Attachments in Explaining Community Renewable Energy Projects	2016	UK	8	Spatial design	None
<b>238</b>	Van Veelen, Bregje; Haggett, Claire	Scottish Geographical Journal	Making Sense of the Scottish Community Energy Sector An Organising Typology	2017	UK	5	Sociology	community energy, typology, Scottish energy policy, energy geographies, critical pluralis...
<b>239</b>	van Vliet, Bas J. M.	Journal of Environmental Policy & Planning	Sustainable Innovation in Network-Bound Systems: Implications for the Consumption of Water, Waste Water and Electricity Services	2012	Netherlands	1	Transition Studies	network-bound systems, sustainable consumption, social practices, electricity supply, drinking water, waste water management, the Netherlands
<b>240</b>	Vancea, Mihaela; Becker, Sören; Kunze, Conrad	Revista Internacional de Sociologia	Local embeddedness in community energy projects, A social entrepreneurship perspective	2017	Germany, Spain, UK	3	Economics	Community energy; Energy cooperatives; Public service utilities; Renewable energy; Social e...
<b>241</b>	Vanesa, Castán Broto	Environmental Innovation and Societal Transitions	Social housing and low carbon transitions in Ljubljana, Slovenia	2012	Slovenia	1	Transition Studies	bounded socio-technical experiments; climate change experiments; energy vulnerability; Ljubljana; low carbon transitions; social housing
<b>242</b>	Verbong, G.; Geels, F.	Energy Policy	The ongoing energy transition: Lessons from a socio-technical, multi-level analysis of the Dutch electricity system (1960–2004)	2007	Netherlands	1	Transition Studies	energy transition; long-term socio-technical analysis; Dutch electricity system

243	Verbong, Geert P. J.; Beemsterboer, Sjouke; Sengers, Frans	Energy Policy	Smart grids or smart users? Involving users in developing a low carbon electricity economy	2013	Netherlands	1	Transition Studies	smart grids; users; strategic niche management
244	Viétor, Birte; Hoppe, Thomas; Clancy, Joy	Energy, sustainability and society	Decentralised combined heat and power in the German Ruhr Valley; assessment of factors blocking uptake and integration	2015	Germany	1	Transition Studies	energy transition; decentralised CHP; energy efficiency; Multilevel perspective
245	Viitanen, J.; Connell,P.; Tommis, M.	Journal of Urban Technology	Creating Smart Neighborhoods: Insights from Two Low-Carbon Communities in Sheffield and Leeds, United Kingdom	2015	UK	2	Science& Techn	energy efficiency; ICTs; innovation; neighborhood; smart
246	von Bock und Polach, Carlotta; Kunze, Conrad; Maass, Oliver; Grundmann, Philipp	Energy Research & Social Science	Bioenergy as a socio-technical system: The nexus of rules, social capital and cooperation in the development of bioenergy villages in Germany	2015	Germany	5	Sociology	bioenergy; nexus; social capital; cooperation; rural community
247	Walker, Gordon	Energy Policy	What are the barriers and incentives for community-owned means of energy production and use?	2008	UK	2	Science& Techn	renewable energy; community ownership; cooperatives
248	Walker, Gordon	Wiley Interdisciplinary Reviews: Climate Change	The role for 'community' in carbon governance	2011	UK	2	Science& Techn	none
249	Walker, Gordon; Cass, Noel	Area	Carbon reduction, the public and renewable energy: engaging with socio- technical configurations	2007	UK	5	Sociology	renewable energy; public; socio-technical configurations; UK
250	Walker, Gordon; Devine- Wright,Patrick	Energy Policy	Community renewable energy: What should it mean?	2008	UK	9	Norms& Values	community; renewable energy; UK policy
251	Walker, Gordon; Devine- Wright,Patrick; Hunter, Sue; High, Helen; Evans, Bob	Energy Policy	Trust and community: Exploring the meanings, contexts and dynamics of community renewable energy	2010	UK	2	Science& Techn	community; renewable energy; trust
252	Warbroek, Beau; Hoppe, Thomas	Sustainability	Modes of Governing and Policy of Local and Regional Governments Supporting Local Low-Carbon Energy Initiatives; Exploring the Cases of the Dutch Regions of Overijssel and Fryslân	2017	Netherlands	6	Governance	local low-carbon energy initiatives; low- carbon policy; policy innovation; institutional a...
253	Weil, Benjamin	Journal of Political Ecology	Solar city, bike city, growth city: governance and energy in Davis, California	2013	USA	6	Governance	none

<b>254</b>	Wesselink, A.; Gouldson, A.	Policy Sciences	Pathways to impact in local government: the mini-Stern review as evidence in policy making in the Leeds City Region	2014	UK	6	Governance	climate change; low carbon policy; local government; evidence-based policy making; policy work
<b>255</b>	Whitmarsh, Lorraine; Seyfang, Gill; O'Neill, Saffron	Global Environmental Change	Public engagement with carbon and climate change: To what extent is the public carbon capable?	2011	UK	9	Norms& Values	public understanding; climate change; carbon; low-carbon lifestyles
<b>256</b>	Wilkens, Ines; Schmuck, Peter	Sustainability	Transdisciplinary evaluation of energy scenarios for a German village using multi-criteria decision analysis	2012	Germany	7	Energy planning	Multi-Criteria Decision Analysis; PROMETHEE; renewable energy systems; public participation; sustainable development
<b>257</b>	Wirth, Steffen	Energy Policy	Communities matter, Institutional preconditions for community renewable energy	2014	Italy	5	Sociology	Community energy Biogas cooperatives Institutional forces
<b>258</b>	Wüste, Andre; Schmuck, Peter	Sustainability	Bioenergy villages and regions in Germany: An interview study with initiators of communal bioenergy projects on the success factors for restructuring the energy supply of the community	2012	Germany	5	Sociology	bioenergy village; renewable energy sources; success factors
<b>259</b>	Wüstenhagen, Rolf; Wolsink, Maarten; Bürer, Mary Jean	Energy Policy	Social acceptance of renewable energy innovation: An introduction to the concept	2007	none	4	Acceptance	social acceptance; wind energy; diffusion of innovation
<b>260</b>	Yalcin-Riollet, Melike; Garabua-Moussaoui, Isabelle; Szuba, Mathilde	Energy Policy	Energy autonomy in Le Mené, A French case of grassroots innovation	2014	France	1	Transition Studies	Grassroots innovations Local energy autonomy France
<b>261</b>	Yildiz, Özgür	Renewable Energy	Financing renewable energy infrastructures via financial citizen participation, The case of Germany	2014	Germany	3	Economics	Renewable energy finance Energy cooperatives Citizen participation Closed-end funds Busine...
<b>262</b>	Yildiz, Özgür; Rommel, Jens; Debor, Sarah; Holstenkamp, Lars; Mey, Franziska; Müller, Jakob R.; Radtke, Jörg; Rognli, Judith	Energy Research & Social Science	Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda	2015	Germany	3	Economics	decentralization; energy cooperatives; energy transition; trust; participation; civic engagement
<b>263</b>	Zoellner, Jan; Schweizer-Ries, Petra; Wemheuer, Christin	Energy Policy	Public acceptance of renewable energies: Results from case studies in Germany	2008	Germany	4	Acceptance	public acceptance; environmental psychology; multi-modal research design

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100% renewable energy systems	civil society	community planning
aboriginal peoples	clean energy	community renewable energy
acceptance	climate	community renewable energy network
acceptance of wind energy	climate action planning	community renewables
action research	climate and energy model regions	community sustainability plan
activism	climate change	community transitions
agency	climate change adaptation	community-based renewables
agency and capacity	climate change experiments	compensation
agriculture	climate change mitigation	complexity
analytical-evaluative framework	climate change policy	conditions of possibility
Atikokan Generation Station	climate governance	configurations
Australia	climate mitigation	conflict
behaviour	closed-end funds	conflict dynamics
behaviour change	cluster growth	conspicuous sustainability
behaviour change programmes	co-operative	constructed landscape
Berlin	coevolution	constructive technology assessment
Berlin-Brandenburg	cogeneration	consumption
beWhere	cohousing	contingent valuation
bioenergy	collaboration	conviviality
bioenergy village	collaborative network	cooperation
biogas	collaborative planning	cooperative
biogas cooperatives	collective identity	cooperatives
biomass district heating	commons	critical discourse analysis
bottom-up innovation	commonwealth	critical niches
boundary objects	communal energy	critical pluralism
boundary organizations	communities	cultural sustainability
boundary work	community	data envelopment analysis
bounded socio-technical experiments	community benefits	decentralisation
business models	community capacity	decentralised CHP
Canada	community co-ownership	decentralised energy
Canadian energy markets	community consumption	decentralised generation
capacity	community development	decentralized energy production
carbon	community empowerment	decentralized governance
carbon dioxide (CO <sub>2</sub> ) emissions	community energy	decentralized renewable energy
central-local relations	community energy management	decision-making tools
choice experiments	community energy plan	degrowth
cities	community energy planning	deliberative democracy
citizen groups	community engagement	demographics
citizen participation	community generation	destabilization
citizen participation initiatives	community identity	development
citizen power plants	community initiatives	development paradigm
civic culture	community interest companies	devolution
civic energy communities	community leadership	diffusion of innovation
civic energy sector	community ownership	discourse
civic engagement	community participation	discourse networks

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discourses	energy initiatives	EU-FP7project PLEEC
distributed economies	energy innovation systems	Europe
distributed energy resources	energy management	European Alps
distributed generation	energy network companies	evaluation
district heating	energy neutrality	evidence-based policy making
district heating and cooling	energy ownership	evolutionary governance
domestic energy	energy planning	expectations
drinking water	energy policies	fairness
DSO	energy policy	feed-in tariff
Dutch electricity system	energy potential mapping	feedback
dynamic processes	energy poverty	Feldheim
dynamic systems	energy region	Flanders
ecological citizenship	energy resources	flexibility
ecological justice	energy scenarios	Florida
ecology	energy self-sufficiency	focus groups
economic development	energy service companies (ESCOs)	France
economic geography	energy strategy	fuel poverty
economic sociology	energy system	geographies of transitions
economics	energy system based on renewable energy	geography
ecotourism	energy system transition	Germany
electric utility	energy systems integration	governance
electricity	energy transition	governance of innovation diffusion
electricity supply	energy transition and green gas	grassroots
electricity supply companies	energy transitions	grassroots action
emotions	energy vulnerability	grassroots initiatives
employment	energy-planning	grassroots innovation
empowerment	energy-self-sufficient community	grassroots innovations
enactment	engagement	Greece
end-use analysis	engineering	green buildings
energy	entrepreneurs	green electricity
energy & environment	environment	green energy autonomy
energy and climate policy in Austria	environmental activism	green growth
energy autarky	environmental awareness	greenhouse gases
energy autonomy	environmental citizenship	Güssing
energy behaviours	environmental impact	Hannover
energy café	environmental justice	heat maps
energy commons	environmental non-governmental	heat pumps
energy company	organisations	heritage
energy concept	environmental planning	Hexham River Hydro
energy conflicts	environmental psychology	historical hydropower
energy conservation	environmental sustainability	home energy system
energy cooperatives	environmentalism	Huntly UK
energy efficiency	equality	hybridity
energy geographies	equity	hydrogen
energy geography	equity participation	ICTs
energy governance	ESCO	immersive telecommunications

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impact analysis	local actors	low carbon transitions
incumbent regimes	local agenda 21	low impact
individuals	local authorities	low-carbon
informed cities	local authority	low-carbon communities
innovation	local capacity	low-carbon community groups
innovation diffusion	local climate change action plan	low-carbon economy
institutional adaptation	local climate governance	low-carbon electricity transition
institutional arrangements	local community	low-carbon energy systems
institutional change	local context	low-carbon lifestyles
institutional economics	local development	low-carbon neighbourhoods
institutional forces	local economic development	low-carbon policy
institutional resilience	local energy	low-carbon transitions
institutional space	local energy autonomy	management
institutions	local energy company	marginal land
integrated modelling	local energy governance	marine renewables
integration system	local energy initiative	market devices
interactive governance	local energy initiatives	market-based innovations
interfaces	local energy system	material politics
intermediaries	local energy systems	medium-sized cities
intermediary actors	local energy transitions	methodologies
intermittent	local enterprise partnerships	micro-hydro
investments	local environmental governance	microgeneration
investors risk	local experiments	middle actors
island	local government	middle-out
islands	local governments	monitoring and evaluation
Italy	local initiatives	multi-criteria decision analysis
Jühnde	local low-carbon energy initiatives	multi-level perspective
justice	local manufacturing system	multi-modal research design
knowledge	local municipalities	multicriteria decision aid (MCDA)
knowledge exchange	local organic food	multilevel climate governance
Lake District	local policy	multilevel governance
land use impacts	local politics	municipal energy plans
landscape architecture	local renewable energy	municipal utilities
law	local renewable energy cooperatives	municipal utility
LCA	local renewable energy organisation	municipalities
leadership	local sustainability	municipality
learning	local sustainable development	narrative
legal governance	localisation	narratives
legal institutions	localism	national energy
legitimacy	long-term industrial change	neighbourhood
life cycle assessment	long-term socio-technical analysis	neoliberalism
lignite coal	low carbon	Netherlands
Ljubljana	low carbon city	network of enterprises
lobbying	low carbon governance	network-bound systems
local	low carbon policy	networks
local acceptance	low carbon transition	new energy projects



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nexus	practice	renewable
niche development	practices	renewable electricity
niches	privatization	renewable energies
normative alignment	pro-environmental behaviour	renewable energy
North America	procedural and distributive justice	renewable energy communities
North of England	process and outcome	renewable energy cooperative
number governance	processual analysis	renewable energy finance
nurturing	production	renewable energy policy
object conflict	program administration	renewable energy projects
off-grid	project management	renewable energy sources
operational design	PROMETHEE	renewable energy supply
organic urban development	promotion instruments	renewable energy systems
organisation	prosaic state	renewable energy technology
own power	prosumers	renewable energy transition
ownership	prosumption	repertory grid
participation	protective space	RES
Participatory Action Research (PAR)	public	research
participatory governance	public acceptance	residential energy efficiency
partnership	public engagement	residential solar
path creation	public opinion	residential storage
path dependence	public participation	resilience
path-dependency	public policy	resilient community development
peak oil	public service utilities	resistance
peer-to-peer	public sphere	resource mobilization
perception	public understanding	revenues
peripheralization	public utilities	risk
phase model	public values	rural
photovoltaics	public works	rural communities
place attachment	public-private partnerships (PPP)	rural community
place attachments	radical innovation	rural development
place-based identity	re-localisation	rural Scotland
plan evaluation	re-municipalization	rural sustainability
planning	recruitment	Samsø
policy	regime	scale
policy analysis	regime shift	scenarios
policy innovation	regional development	Scotland
policy processes	regional energy modeling	Scottish energy policy
policy work	regional geography	seedbed of innovation
political economy	regional innovation systems	self-determination
politics	regulation	self-organization
politics of community energy pro- duction	regulatory state	self-organized energy communities
politics of range	reinvestment	self-sufficiency
post-carbon	religion	shared ownership
post-politics	relocalisation	sharing economy
power	remote communities	small and medium-sized cities
	remunicipalisation	small scale production systems

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small-scale energy technology	strategy models	transport
smart grids	subnational governments	trust
social acceptance	success conditions	typology
social capital	success factors	UK
social economy	supply chains	UK energy system
social entrepreneurship	survey	UK policy
social housing	sustainability	uncertainty
social impacts	sustainability interventions	United Kingdom
social innovation	sustainability planning	United States
social justice	sustainability transition	urban
social learning	sustainability transitions	urban commons
social movements	sustainable	urban energy generation
social network analysis	sustainable communities	urban energy transition
social niche	sustainable consumption	urban experiments
social norms	sustainable development	urban governance
social practice theory	sustainable energy	urban living lab
social practices	sustainable energy communities	urban planning
social research	sustainable energy landscapes	urban policy
social resilience	sustainable energy planning	urban sustainability
social study	sustainable energy technology	user communities
social-ecological system	sustainable energy transition	user innovation
socio-economic aspects	sustainable energy transitions	user-led innovations
socio-materiality	sustainable innovation	user-led technological change
socio-technical analysis	sustainable places	users
socio-technical change	sustainable regional development	Växjö
socio-technical configurations	system builder	visions
socio-technical regime	systemic design	Wales
socio-technical systems	tacit knowledge	waste water management
socio-technical transitions	targets	wind
sociotechnical configurations	technological innovation systems	wind energy
sociotechnical imaginary	territorial governance	wind power
solar champion	the Netherlands	wood pellets
spatial arrangements	the United Kingdom	
spatial planning	transformation	
spatial representations	transformative power	
spatiality	transition	
sprawl farm	transition management	
stakeholder influence	transition network	
stasis	transition pathways	
state energy efficiency and re-	transition pathways typology	
newable energy program	transition pathways/mechanisms	
strategic design	transition research	
strategic energy planning	transition town movement	
strategic niche management	transition towns	
strategic niche management theory	transitions	
strategies	translation	

In several European countries, an increasing part of the production of renewable energy is generated by citizen-owned production units. These units are installed and managed individually or by local communities, and the number of local energy initiatives, who aim to increase local energy production, is rising rapidly. This has resulted in a new research area we label as community energy. Community energy is defined as local production of renewable energy, governed by citizens, with a view to contribute to the transition to a sustainable energy system. In this study, the authors use community energy to encompass several terms that have been used so far in the literature, such as citizen's power, grassroots energy, and local governance of energy production. They specifically address the role of the individual, acting as consumer, prosumer or citizen. The aim of the study is to identify the key issues and concepts covered in the community energy literature so far and to reflect on how it is being studied.

It shows community energy is studied from a variety of perspectives, delivering insights that range from individual motivations of members to join these groups, the organisation of local community initiatives, their relations with local governments, regional support organisations and networks, to national policies that aim to stimulate decentralized community owned energy production. All approaches will have to specify and develop in order to understand and explain community energy in more detail. In addition, there is room to further reflect on the agency that is employed by local communities and how bottom-up changes in the energy structure occur. The authors argue that the study and practice of community energy could benefit from a transdisciplinary research approach, which integrates perspectives of multiple academic disciplines and non-academic stakeholders. Moreover, this could lead to policy development that is science-based and practice oriented.

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